INDUSTRIAL HYGIENE INFORMATION AND REGULATORY ACTIONS SUMMARY

February 2005

REGULATORY ACTIONS

Direct Final Rule on National Consensus Standards Withdrawn

The Occupational Safety and Health Administration (OSHA) announced the withdrawal of a direct final rule for updating OSHA standards that are based on national consensus and industry standards. The rule was part of an agency effort announced in November 2004 to update OSHA standards that reference or include language taken directly from outdated consensus standards. OSHA uses the direct final rule approach on various issues that normally receive universal support from labor and industry. This approach saves regulatory resources on notice and comment rulemaking (when there is no opposition) by eliminating one stage in the rulemaking process. If no significant adverse comments are received, the final rule takes effect. However, as in this case, the agency will proceed with normal rulemaking since one adverse comment was received. That comment will be addressed in a new final rule to be issued shortly. The announcement appeared in the February 18 Federal Register (http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=FEDERAL_REGISTER&p_id=18302).

LEGISLATIVE ACTIONS OF INTEREST

AIHA Governmental Affairs Special Report on State Activities

So far in 2005, AIHA government affairs has reviewed approximately 3,500 state legislative measures. Of these, approximately 200 have been forwarded to local sections for informational purposes and possible action.

Professional Recognition/Title Protection

Four states have introduced legislation addressing one of the most important issues to the industrial Hygiene community:

Georgia –

A bill has been introduced defining the profession of IH, safety and health physics. The certified titles of these professions would also be protected. The bill was reported favorably out of a House Committee on February 23 and is now scheduled for a vote by the full House.

Illinois –

A bill has been introduced in Illinois that would make a small technical correction to existing law that provides voluntary licensing for the profession of industrial hygiene. The technical change would have no impact on existing law.

New York –

The local sections and chapters of AIHA and ASSE have successfully introduced legislation in New York that would create a new license for industrial hygiene and safety. The bill has been introduced several times in the past and, again, will be very difficult to enact.

Ohio –

Legislation has been introduced to amend the existing professional recognition/title protection law in Ohio. The bill was drafted by AIHA and would replace the term "industrial hygienist in training" with the newer term "certified associate industrial hygienist". It would also define and protect specific titles within the profession of health physics.

Mold Inspection and/or Remediation

The issue of mold remains a "hot topic" in numerous states, though not as active as in previous years. With the state of Texas still being the only state with comprehensive regulations that address the issue of competency for individuals (Texas requires licensing of all individuals) several others are attempting to enact similar legislation.

Florida –

Florida has two bills introduced that would require licensing of all individuals involved in mold assessment and mold remediation. The bills are identical – one in the House and one in the Senate. These bills are also identical to what was introduced in the last Florida legislative session and face a difficult task of being enacted.

Georgia –

One bill has been introduced in Georgia that would require licensing of individuals engaged in the microbial profession. The bill creates a "Contamination Commission" to develop the regulations for the program. The Commission membership would include a member of AIHA and a member of ACGIH.

Illinois –

Three bills have been introduced in Illinois, but at this time the measures are only a "short title". This means they are being reserved for language that will be added later. Illinois recently completed a task force report on the issue of mold and this report is expected to provide the focus of the legislative language that will be inserted.

Indiana –

One bill has been introduced that would create a task force to develop recommendations concerning mold. A CIH is defined in the bill and would be a member of the task force.

Massachusetts –

Two bills are being drafted to address the issue of mold. AIHA national has not yet seen the language.

Maryland –

One bill would establish an Indoor Air Quality Task Force to look at indoor air quality issues within educational institutions. While the bill does not specifically address the issue of mold, mold is one of the categories to be studied.

Nevada –

A bill is being drafted that would require the licensure of persons engaged in the control of mold. It is expected that this bill will be identical to the one introduced in the last session of the Nevada legislature.

New York –

Four bills have been introduced. Two of these bills would create a task force to advise the state on the development of standards with regard to mold. The other two bills pertain to the remediation and prevention of mold and require the disclosure of mold history upon the sale of real property and/or create a mold hazard insurance program. Both of these measures will be very difficult to enact.

Texas –

And finally, Texas is still at it. Two bills have been introduced. One is a simple measure that would exempt school districts from licensing requirements. The other measure pertains to certificates of mold remediation.

Methamphetamine Laboratory Cleanup

Undoubtedly, this is the issue that seems to be exploding on the state legislative front. The issue of interest to AIHA pertains to the requirements for meth lab cleanup. Numerous states enacted some type of legislation and/or regulations in the past year or two, but this year a substantial number are also looking at the issue.

Here's what we do know. Prior to this year, the states of Arkansas, Colorado, Illinois, Minnesota, Oregon, Tennessee and Washington have put cleanup requirements in place.

Oregon –

The Oregon regulations are very thorough and, unfortunately, require all individuals involved with meth lab cleanup to undergo OSHA HazCom training and pass a state examination in order to be licensed. The program is very similar to what the state of Texas did with mold.

Illinois –

Illinois has published a fact sheet on meth lab cleanup. The fact sheet describes what to do, when to do it, and how to do it. Included in the fact sheet is the statement "If sampling is necessary, it should only be done by a worker trained according to U.S. OSHA standards. Preferably, a certified industrial hygienist should be consulted before any sampling is done."

Colorado –

The regulations governing meth lab cleanup in Colorado become effective next month. As part of the requirements, a certified industrial hygienist or qualified industrial hygienist must sign off approval of the cleanup operations.

Current Legislation –

In addition to four separate federal measures addressing the issue of meth labs, research, etc., the states are jumping into this issue with full force.

As of today, there are at least 20 separate state legislative measures introduced that would require the state to come up with regulations that would address the issue of meth labs and the cleanup of such labs. AIHA national is working with other national organizations that have a vested interest in this issue. One of these organizations has expressed interest in seeing that CIHs are required to sign off on these cleanup operations.

Occupational Safety and Health Funding

Two issues readers should be aware of:

Utah –

A bill has been introduced in Utah that would provide for an offset of a portion of workers compensation premiums to be applied to the Education Research Center in Utah for increased funding for occupational safety and health training and education. The bill has been reported favorably out of a House Committee and awaits further action.

New York –

Governor Pataki has proposed to eliminate the Hazard Abatement Board and reduce New York's commitment to the Occupational Safety and Health Training and Education Program. This program is vital to the training of individuals serving on the front line of health and safety in New York and AIHA is opposed to this proposal.

Ergonomics

The issue of ergonomics seems to "have fallen off the map" in the states. As of today, AIHA is only aware of one measure introduced in the states. This measure (California) is a bill that would establish a health care worker back injury prevention plan.

OSHA ACTIVITIES

Kim Lazor Appointed OSHA Chief of Staff

Jonathan Snare, Acting Assistant Secretary of Labor for OSHA, announced the appointment of Kim Lazor as the agency's new Chief of Staff. Lazor has served for the past three years as a special assistant for the agency and has been key to expanding the agency's compliance assistance efforts and stakeholder outreach. As Chief of Staff, Lazor will serve as a senior member of OSHA's management team and work with Snare and others on agency policy, oversight and management.

OSHA Identifies 14,000 Workplaces with High Injury and Illness Rates

The Occupational Safety and Health Administration has identified and sent letters to almost 14,000 workplaces with the highest occupational injury and illness rates and is urging the employers to take action to remove hazards causing the high rates. The employers were those whose establishments are covered by Federal OSHA and reported the highest "Days Away from work, Restricted work or job Transfer injury and illness" (DART) rate to OSHA in a survey of 2003 injury and illness data. For every 100 full-time workers, the 14,000 employers had 6.5 or more injuries or illnesses that resulted in days away from work, restricted work or job transfer. The national average is 2.6.

The letter encouraged employers to consider hiring an outside safety and health consultant, talking with their insurance carrier, or contacting the workers' compensation agency in their state for advice. An excellent way for employers with 250 or fewer workers to address safety and health is to ask for assistance from OSHA's on-site consultation program. The consultation program is administered by state agencies and operated separately from OSHA's inspection program. The service is free, and there are no fines even if problems are found. The letter told the employer where the OSHA consultation program in that state may be contacted. The data collected were designed to provide establishment specific injury and illness information.

The 14,000 sites are listed alphabetically, by state, on OSHA's web site at: http://www.osha.gov/as/opa/foia/hot_11.html. The list does not designate those earmarked for any future inspections. An announcement of targeted inspections is expected to be made later this year.

NIOSH ACTIVITIES

Request for Public Review and Comment of NIOSH Alert

The public is invited to review and make comments on the draft version of the NIOSH Alert: Preventing Asthma and Death from MDI Exposure During Spray-on Truck Bed Liner and Related Applications. The Alert contains important safety information that is needed by the public. Input will strengthen efforts to create documents that support the NIOSH mission: prevention of work-related illnesses and injuries.

The draft Alert can be accessed on the NIOSH Web site at http://www2a.cdc.gov/truckbedliner. The Alert summarizes case reports of death and disease following occupational exposure to methylene- bis (phenyl isocyanate) (MDI) and makes recommendations for preventing asthma, other respiratory disease, and death from exposure to MDI during spraying operations.

Proceedings of the International Conference Available

The proceedings and workshop report for Session II of the *International Conference on Occupational and Environmental Exposures of Skin to Chemicals: Science and Policy* held in Washington, DC, on September 8–11, 2002 will be published in the March issue of Regulatory Toxicology and Pharmacology [41(2):150–158]. This NIOSH sponsored conference brought together dermatologists, industrial hygienists, laboratory researchers, policy makers, and occupational physicians to focus on the science, knowledge gaps, and policy opportunities related to the occupational and environmental exposures of skin to chemicals. In *Session II: Health Effects and Hazard Identification*, workshop participants discussed the research efforts in evaluating dermal hazards and the effective actions for improving the process of health hazard identification. Drs. Chen-Peng Chen (NIOSH) and Pietro Sartorelli (University of Siena, Italy) authored the workshop report. Additional information is available on the NIOSH Web site at http://www.cdc.gov/niosh/topics/skin/conference/index.html.

EMS Worker Risk in Ambulance Crashes to be Studied

Riding and working in the patient compartment of an ambulance places Emergency Medical Services (EMS) workers at the potential risk of injury on every call. To improve assessment of injury risks to EMS workers in ambulance crashes, the Division of Safety Research recently signed a Letter of Agreement with American Medical Response (AMR) to analyze non-fatal injuries to EMS workers. AMR is the largest private ambulance service provider in the United States. Under the agreement, NIOSH and AMR researchers will conduct a detailed analysis of national-level data of non-fatal injuries to private service EMS workers using a database maintained by AMR. The results of these analyses will be useful in identifying potential injury risk factors for EMS workers, and complement current NIOSH research to improve the design of ambulance patient compartments and occupant restraint systems to better protect EMS workers. More information on motor vehicle safety can be found at http://www.cdc.gov/niosh/injury/traumamv.html.

New Analytical Method for Chromium^{VI} Patented

The challenge for employers and occupational health professionals: finding an analytical method that will identify hexavalent chromium (CR^{VI}) at very low levels. The answer is a new analytical method developed by NIOSH. The method is now available for commercial licensing under U.S. Patent 6,808,931, issued to NIOSH on Oct. 26, 2004. The method reliably identifies and measures CR^{VI} at lower levels than those detectable using traditional methods. It does so through ultrasonication and strong anion exchange solid phase extraction. This method consists of using an ultrasonic bath and buffer solution to extract CR^{VI} from samples and using a chemical resin to

separate/isolate CR^{VI} from other metals and potential interferences in the extracted sample solutions. It has been extensively field-tested by NIOSH, and the results of those tests have been published in peer-reviewed journals. The method follows many other analytical techniques, first devised and validated by NIOSH, that have become standard industrial hygiene practices over the past 30 years.

For more information on licensing the method, contact DeLon Hull at DHull@cdc.gov. For further technical information, contact Kevin Ashley at KAshley@cdc.gov.

EPA ACTIVITIES

President Nominates Stephen Johnson as EPA Administrator

President Bush nominated Stephen L. Johnson to become the eleventh Administrator of the Environmental Protection Agency. Johnson, currently Acting Administrator, has been with EPA for 24 years. Johnson's nomination now goes to the U.S. Senate for confirmation.

EPA Proposes Options for Maintaining NO_x Air Quality Standards

On February 14, 2005, EPA proposed three regulatory options to maintain air quality in areas that meet national air quality standards for nitrogen dioxide (NO_2). The Clean Air Act's Prevention of Significant Deterioration (PSD) program for NO_x uses "increments" to limit the amount of air quality deterioration that may occur in any given area of the country. For this purpose, ambient concentrations of NO_2 are measured in micrograms per cubic meter. New and modified industrial facilities must evaluate the impact of their emissions of nitrogen oxides (NO_x) in a clean air area to demonstrate that they will not cause or contribute to a violation of any national ambient air quality standard or degrade the air beyond the level allowed by PSD increments for NO_x. To ensure that air quality does not deteriorate in PSD areas, states and tribes issue Clean Air Act permits requiring proposed new and expanded facilities to install state-of-the-art air pollution controls. While the PSD program is intended to maintain air quality, numerous other Clean Air Act regulations on stationary and mobile sources have reduced and will further reduce NO_x emissions in the United States.

This action proposes the three following options:

1. To retain the existing increments NO_x measured as nitrogen dioxide (NO_2) in the ambient air as established in October 1988;
2. To allow states that choose to implement an interstate cap and trade program for sources of NO_x to rely on the benefits of that program in place of the existing increments to prevent significant deterioration of NO_2 air quality; or
3. To allow states to adopt their own planning strategies and implement these in lieu of the NO_2 increment system if they show that PSD for NO_x is satisfied through some combination of state and federal emissions controls that have been or will be adopted.

NO_x is a precursor to the formation of ground-level ozone and fine particle pollution. At elevated levels these pollutants can have significant health effects aggravating heart and lung conditions, increasing susceptibility to respiratory illnesses, damaging lungs. Fine particles are also associated with premature death. In addition, these pollutants have negative environmental impacts including vegetation damage, acid deposition, and visibility impairment.

Under the current PSD program for NO_x and in conjunction with numerous other air pollution control programs and regulations on industries and vehicles, NO_x emissions in the United States have fallen from 25.1 million tons per year in 1990 to 20.5 million tons in 2003, according to EPA's most recent air emissions trends report: http://www.epa.gov/airtrends/econ-emissions.html.

In addition, ozone levels have decreased over the past 10 to 25 years. In 2003, the improved air quality resulted mainly from favorable weather conditions and continuing reductions in emissions, according to EPA's most recent ozone air quality trends report: http://www.epa.gov/airtrends/ozone.html. Several future regulations on industry, power plants and vehicles are expected to further reduce NO_x emissions and help prevent the formation of ground-level ozone. Information on these future regulations is available online at: http://www.epa.gov/cleanair2004/.

EPA will accept comment on this proposal for 60 days following publication in the Federal Register. For further information and a pre-publication copy of the proposed rule, visit: http://www.epa.gov/nsr/actions.html.

EPA Sets Reference Dose for Perchlorate

EPA has established an official reference dose (RfD) of 0.0007 milligrams per kilogram body weight per day (mg/kg/day) of perchlorate. This level is consistent with the recommended reference dose included in the National Academy of Science's January 2005 report. A reference dose is a scientific estimate of a daily exposure level that is not expected to cause adverse health effects in humans.

EPA's reference dose, which assumes total intake from both water and food sources, is appropriate and protective for all populations, including the most sensitive subgroups. The selected reference dose contains a full ten-fold uncertainty factor to protect the most sensitive population, the fetuses of pregnant women who might have hypothyroidism or iodide deficiency. This uncertainty factor also covers variability among other human life stages, gender and individual sensitivities, protecting not only adults, but also other sensitive subpopulations such as premature neonates, infants and developing children.

Perchlorate exposure has the potential of blocking iodide uptake to the thyroid gland. NAS identified the non-adverse effect of the inhibition of iodine uptake as the key biochemical event that precedes the occurrence of all potential adverse effects of perchlorate exposure. EPA's RfD is conservative and health protective because it is designed to prevent the occurrence of any biochemical changes that could lead to adverse health effects.

EPA's reference dose for perchlorate will be posted on the agency's online IRIS database, which contains risk information on possible human health effects from exposure to chemical substances in the environment.

EPA's new RfD translates to a Drinking Water Equivalent Level (DWEL) of 24.5 parts per billion (ppb). A Drinking Water Equivalent Level, which assumes that all of a contaminant comes from drinking water, is the concentration of a contaminant in drinking water that will have no adverse effect with a margin of safety. Because there is a margin of safety built into the RfD and the DWEL, exposures above the DWEL are not necessarily considered unsafe. EPA's Superfund cleanup program plans to issue guidance based on the new RfD.

Perchlorate has been used in various items, including missile and rocket propellants, munitions and fireworks, flares, automobile airbags and pharmaceuticals. It may also occur naturally and has been found in some fertilizer. Perchlorate has been detected in drinking water in some systems around the country, as well as in certain foods.

The perchlorate summary is available on the IRIS web site at http://www.epa.gov/iris and at http://www.epa.gov/perchlorate.

EPA Considers Contaminants for Possible Future Drinking Water Regulations

EPA is researching and evaluating a list of 51 unregulated, new or emerging drinking water contaminants for possible regulation. The Contaminant Candidate List (CCL) process was established by the 1996 Amendments to the Safe Drinking Water Act (SDWA) as a tracking and priority-setting mechanism to determine if new regulations are needed to protect drinking water safety.

Unregulated contaminants that are known or anticipated to occur in drinking water comprise the list. The SDWA requires EPA to conduct extensive research into the occurrence and health effects of the listed contaminants before issuing new regulations or standards. With this action, EPA is releasing the second CCL - which carries over a number of contaminants from the first CCL - and announcing plans to expand and strengthen the contaminant candidate listing process.

The SDWA directs EPA to periodically publish a list of contaminants that "at the time of publication, are not subject to any proposed or promulgated national primary drinking water regulation, which are known or anticipated to occur in public water systems, and which may require regulation. In July 2003, EPA removed contaminants from the first CCL after the Agency concluded that sufficient data and information was available to determine not to regulate nine contaminants.

EPA is publishing both a final CCL and an update on the Agency's work to improve the CCL selection process. EPA is reviewing more contaminants for inclusion on the third CCL and is working to implement a more transparent system for selecting contaminants. EPA's new approach will produce a more comprehensive CCL because the process will address a wider range of information and screen contaminants more

systematically, as was recommended by the National Academy of Sciences and the National Drinking Water Advisory Council.

Information on the CCL is available on EPA's Web site at: http://www.epa.gov/safewater/ccl.

TECHNICAL ARTICLES OF INTEREST

Validation of a Pesticide Exposure Algorithm Using Biological Monitoring

Citation: "*The Validation of a Pesticide Exposure Algorithm Using Biological Monitoring Results*", J. Coble, T. Arbuckle, W.J. Lee, M. Alavanja, M. Dosemeci, Journal of Occupational and Environmental Hygiene, 2005, 2:3, p 194 - 201, http://ujoeh.metapress.com/link.asp?id=tnl2t1y89583p1yy

Abstract: "A pesticide exposure algorithm was developed to calculate pesticide exposure intensity scores based on responses to questions about pesticide handling procedures and application methods in a self-administered questionnaire. The validity of the algorithm was evaluated through comparison of the algorithm scores with biological monitoring data from a study of 126 pesticide applicators who applied the herbicides MCPA or 2,4-D. The variability in the algorithm scores calculated for these applicators was due primarily to differences in their use of personal protective equipment (PPE).

Rubber gloves were worn by 75 percent of applicators when mixing and 22 percent when applying pesticides, rubber boots were worn by 33 percent when mixing and 23 percent when applying, and goggles were worn by 33 percent and 17 percent of applicators when mixing and when applying, respectively. Only 2 percent of applicators wore all three types of PPE when both mixing and applying, and 15 percent wore none of these three types of PPE when either mixing or applying.

Substantial variability was also observed in the concentrations of pesticides detected in the post application urine samples. The concentration of MCPA detected in urine samples collected on the second day after the application ranged from less than less than 1.0 to 610 µg/L among 84 of the applicators who applied MCPA. The concentrations of 2,4-D detected in the urine samples ranged from less than less than 1.0 to 514 µg/L among 41 of the applicators who applied 2,4-D.

When categorized into three groups based on the algorithm scores, the geometric mean in the highest exposure group was 20 µg/L compared with 5 µg/L in the lowest exposure group for the MCPA applicators, and 29 µg/L in highest exposure group compared with 2 µg/L in the low exposure group for the 2,4-D applicators. A regression analysis detected statistically significant trends in the geometric mean of the urine concentrations across the exposure categories for both the 2,4-D and the MCPA applicators. The algorithm scores, based primarily on the use of PPE, appear to provide a reasonably valid measure of exposure intensity for these applicators; however, further studies are needed to generalize these results to other types of pesticides and application methods."

Background: The development and validation of methods to assess exposure to pesticides are vital to improve understanding of the potential hazards to human health. The methods used to assess exposure to pesticides in epidemiology studies vary from indirect surrogates, such as an occupation of farmer, to the direct measurement of pesticides or their metabolites in biological samples. Environmental and biological measurements are generally considered reliable indicators of recent exposure; however, the assessment of exposures based on individual measurements for all subjects in large epidemiology studies is not feasible.

However, quantitative measurement data from smaller scale exposure studies, along with detailed descriptions of factors that may affect exposure levels, can be used to identify exposure determinants. Once identified, questionnaires can be designed to collect information directly from study subjects about important exposure determinants, such as application method or use of personal protective equipment. The responses to these questions can then be analyzed to determine not only whether exposure to a specific pesticide has occurred, but also to estimate the relative intensity of exposure compared to other subjects. In this study, the validity of exposure intensity estimates developed based on questionnaires was evaluated by comparison with exposure measurements.

The Agricultural Health Study (AHS) is a large prospective cohort study with over 55,000 pesticide applicators. The pesticide applicators enrolled in the AHS completed self-administered questionnaires to identify specific pesticides they applied, along with the frequency of application in days per year and total duration of use in years. Questions on mixing procedures, application methods, the repair of pesticide application equipment, and the use of personal protective equipment were also included in the questionnaire. An algorithm was developed to provide a systematic and reproducible method to combine the responses to these questions into a single quantitative exposure intensity score. The exposure intensity score is then combined with information on the frequency and duration of use to calculate a cumulative exposure metric for the epidemiologic analyses of the AHS cohort.

The AHS exposure algorithm was developed based on the premise that self-administered questionnaires can be used to identify pesticide applicators with higher intensity exposures. To evaluate this assumption, the data from a previously published study of herbicide applicators conducted in Canada known as the Pesticide Exposure Assessment Study (PEAS) was used. During the PEAS, detailed questionnaires were completed by 126 herbicide applicators following the application of either MCPA (4-chloro-2-methylphenoxyacetic acid) or 2,4-D (2,4-dichlorophenoxyacetic acid). Urine samples were collected prior to the application and for 2 days following the application. The concentration of MCPA and 2,4-D was measured in these urine samples.

The questionnaire used in the PEAS contained questions that were similar to the questions used in the AHS enrollment questionnaire, thus, the data collected by these investigators provided an opportunity to evaluate the exposure algorithm developed for the AHS. The pesticide exposure intensity scores for the applicators in the PEAS were calculated using the algorithm and then compared with the post application urine

concentrations to evaluate the strength of the relationship between the algorithm exposure intensity scores and the urine concentrations.

Methods: The pesticide exposure algorithm was developed to provide quantitative estimates of exposure intensity based on categorical responses to questions on mixing and application methods, repair activities, and the use of personal protective equipment. The algorithm assigns weighting factors to each of the possible responses to these various questions, which are then combined to calculate a pesticide exposure intensity score. The algorithm variables and their weighting factors were selected based on a literature review of studies in which quantitative exposure measurements were collected during various pesticide application scenarios. The variables and weighting factors used in the general algorithm developed for the AHS are summarized in the Appendix to the article. A more detailed algorithm with additional exposure variables was also developed for the AHS, but this algorithm was not assessed because not all the variables required for the detailed algorithm were included in the PEAS questionnaire.

The general algorithm contains four basic factors: (1) mixing status (MIX), (2) application method (APPLY), (3) equipment repair status (REPAIR) and (4) personal protective equipment (PPE):

$$\textit{Exposure Intensity Score} = (MIX + APPLY + REPAIR) \times PPE$$

The MIX factor is included to represent exposures that occur when handling concentrated solutions and transferring or loading the solutions into the application equipment. The MIX factor takes a value of 0, 3, or 9 depending on how often the applicator mixes pesticides prior to applying. The APPLY factor is intended to represent exposures that occur during the actual application of the pesticide. A larger weighting factor is assigned to application methods with the potential for higher exposure levels.

For example, the use of a backpack sprayer has a weighting factor of 9 compared with a weighting factor of 3 for a tractor boom application method based on the assumption that higher exposures occur when applying with a backpack sprayer than when applying with a tractor boom. The REPAIR factor takes on a value of 2 for applicators who reported performing maintenance and repairs, other than clean-up, on pesticide application equipment. The MIX, APPLY and REPAIR factors are summed, and then multiplied by a reduction factor to account for the use of personal protective equipment.

The use of PPE is generally assumed to reduce the potential for exposure when handling pesticides and, therefore, a reduction factor for PPE is included in the algorithm. To account for all the possible combinations of PPE used by these applicators, the different types of PPE listed in the AHS questionnaire are grouped into three categories, PPE-1, PPE-2 and PPE-3, with reduction factors of 0.8, 0.7 and 0.6, respectively, for the use of PPE from each of these categories. To account for the use of a combination of PPE, a cumulative reduction factor is calculated by combining the reduction factors from each of the categories.

For example, the use of a face shield (PPE-1) results in 20 percent reduction (a factor of 0.8), and the use of disposable coveralls (PPE-2) results in a 30 percent reduction (a factor of 0.7). The use of both a face shield and disposable coveralls results in a 50 percent reduction (a factor of 0.5). The addition of protective rubber gloves (PPE-3) to the ensemble provides a further 40 percent reduction resulting in a reduction factor of 0.1 for use of PPE from all three groups.

In the PEAS study, information on PPE use was collected during four stages of the application process (i.e., mixing, loading, applying and cleanup), whereas, the AHS questionnaire asked only about general use when personally handling pesticides, regardless of the stage of application. In the PEAS study, PPE use varied by stage of the application process, therefore, a separate PPE reduction factor was calculated for each stage and then averaged across the four stages to calculate a single PPE score for each applicator. The PEAS questionnaire also included questions on whether any maintenance and repair activities had been conducted on the day of the application.

Preapplication spot samples, along with two composite urine samples were collected for two consecutive 24-hour periods following the application process. The application day is referred to as Day 0. The Day 1 sample was collected on the first day after the day of application, and the Day 2 sample was collected on the second day after the day of application. A total of 126 applicators in PEAS completed questionnaires. Of these, 89 reported applying MCPA and 43 reported applying 2,4-D, including 11 applicators who reported applying both. There were 5 applicators who did not apply either of these herbicides, and were excluded from this analysis. In addition, 5 of the MCPA applicators and 2 of the 2,4-D applicators applied these herbicides on the day before the baseline sample was collected and were also excluded, leaving 84 of the MCPA applicators and 41 of the 2,4-D applicators for further analysis. Among the 84 applicators who reported applying MCPA, 50 of the applicators applied on one day only and 34 applied on two consecutive days. Among the 41 applicators who applied 2,4-D, 26 applied on one day only and 15 applied on two consecutive days. The questionnaires were administered after the first day of application only, so for applicators who applied on two days, algorithm scores were not calculated for the second day.

The Day 1 urine samples correspond to exposures that occurred during the first day of application. For the subset of applicators who applied on two consecutive days, the Day 2 urine samples are affected by exposures that occurred on two consecutive application days. Therefore, the relationship between the algorithm scores and urine concentrations were analyzed separately for both the Day 1 and the Day 2 urine samples. The analysis of the Day 1 urine samples avoids possible confounding for those applicators who also applied on two days. However, the timing of the Day 2 samples corresponds more closely with the half-life of 2,4-D in urine, which is reported to be between 12 to 72 hours. Also, the Day 2 urine concentrations were consistently higher with fewer samples below the limit of detection, even for applicators who applied on one day only. The limit of detection for both herbicides was 1.0 Micrograms per liter (µg/L) and a value of 0.5 was substituted for the non-detect values to allow logarithmic

transformation of the results and reduce bias introduced by using a value of 0 when calculating mean values.

The responses to questionnaires are often used as categorical variables for epidemiologic analyses. Thus, the algorithm scores were also used to categorize the applicators into low, medium and high exposure groups using cut points of less than 5 for the low, 5–10 for the medium and greater than 10 for the high exposure group. The percent of samples below the limit of detection, the arithmetic and geometric mean concentrations, and the geometric standard deviation of the urine concentrations for these three categories were calculated for both Day 1 and Day 2 urine samples.

The trend in the geometric means across the three exposure categories was evaluated by linear regression analysis of log-transformed urinary concentrations on the mean algorithm scores for the low, medium and high exposure groups. The total duration of the application process in hours was determined based on the start times and finish times reported on the day of application questionnaire. To adjust for differences in the duration, the application hours and number of application days were included in the regression analysis. The pesticide exposure intensity scores ranged from a 1.2 to 14. The algorithm scores were uniformly distributed between these two values.

Almost all the applicators in the PEAS applied using a tractor with a spray boom, thus, the influence of the application method on exposure levels could not be evaluated with this data set. In addition, all but two of the applicators in the PEAS reported mixing herbicides prior to application, and therefore, the MIX variable contributed very little to the variability in algorithm scores. However, 76 percent of the applicators did report performing maintenance and repairs on the application equipment, so the REPAIR variable did contribute to some of the variability in the algorithm scores.

The variability in the algorithm exposure intensity scores among these applicators was due primarily to the differences reported in their use of personal protective equipment (PPE). In general, applicators wore PPE when mixing and loading more often than when applying. The three types of PPE used most frequently were rubber gloves, rubber boots, and goggles. Rubber gloves were worn by 75 percent of applicators when mixing and loading and by 22 percent of applicators when applying pesticides. Rubber boots were worn by 33 percent when mixing and loading and 23 percent when applying. Goggles were worn by 33 percent of applicators when mixing and loading and 17 percent of applicators when applying.

A reduction factor of 1.0 was assigned to applicators who did not use any PPE during any stage of the application process. A reduction factor of 0.1 was assigned to applicators who reported the use of rubber gloves and at least one other type of PPE from each of the other two categories during all four stages of the application process.

There was a wide range in the urinary concentrations detected in both the Day 1 and Day 2 samples. The range presumably reflects variability in the exposure received during the application of herbicides among these applicators, as well as variability in the metabolism and excretion rates. The Day 2 urine concentrations of MCPA ranged from less than 1.0 g/L to 610 µg/L with a geometric mean 14.2 µg/L among the 84

applicators who reported applying MCPA. The Day 2 urine concentrations of 2,4-D ranged from less than 1.0 µg/L to 520 µg/L among the 41 applicators who reported applying 2,4-D.

Descriptive statistics for the MCPA and 2,4-D applicators grouped by algorithm score into low (less than 5), medium (5–10), and high (greater than 10) ranges. For applicators in the low exposure group, 40 percent of the urine samples had concentrations below the limit of detection for both MCPA and 2,4-D, while in the highest exposure group, only 8 percent of the MCPA applicators and none of the 2,4-D applicators had concentrations below the limit of detection. The geometric mean concentration detected in the Day 2 urine samples was four times higher in the highest algorithm exposure group compared with the lowest exposure group for MCPA applicators, and 14 times higher for the 2,4-D applicators. In addition, a statistically significant increase in the geometric mean concentration was detected across the exposure groups for both herbicides. There was, however, a wide range of urine concentrations detected within each of the three groups as shown in the box plots of the Day 1 and Day 2 urine samples for the MCPA and 2,4-D applicators.

Discussion: Questionnaires are often used in epidemiologic studies to collect information directly from individual subjects, particularly for situations in which exposures cannot be measured. In a study of pesticide applicators, questionnaires were used to collect information on the previous use of specific pesticides, including information on the frequency and duration of use, along with application methods and the use of personal protective equipment. An algorithm was developed to convert the categorical responses from questionnaires into quantitative exposure intensity scores that could be used to calculate cumulative exposure metrics based on both the duration and intensity of exposure.

Questionnaires provide an efficient method to collect information on the use of pesticides for determining duration of exposure, but the validity of using questionnaires for estimation of exposure intensity has not been as well established. The results of environmental and biological monitoring studies have generally indicated potentially large variability in exposure levels when handling pesticides due to a variety of factors that include but are not limited to the application method, personal hygiene, and the use of personal protective equipment. While biological monitoring has several advantages for assessing exposure to pesticides, the use of biological monitoring in a large-scale epidemiology study such as the AHS is not currently feasible due to factors such as cost and logistical constraints. Also, biological monitoring is not useful for assessment of past exposures to pesticides with short half-lives. Therefore, questionnaires will remain important tools for the collection of exposure information for the foreseeable future.

The PEAS study was designed to identify factors that influence exposure to pesticides under actual field conditions, and the questionnaires used collected information on approximately 130 variables thought to have a possible influence on exposure levels. In the published results from the PEAS, a multivariate regression analysis was used to determine which of these variables had a significant influence on urinary

concentrations. The factors found to be significant predictors of urinary herbicide levels included pesticide formulation, the use of protective clothing/gear, type of application equipment, handling and personal hygiene practices. However, the specific factors differed for the two herbicides thereby limiting the extent to which the results could be generalized for prediction of exposures to other pesticides and for other application scenarios.

In an ideal validation study, applicators would be assigned randomly to specific exposure groups in which the amount of pesticide applied, the timing and duration of the application, and the use of PPE use would be carefully monitored and controlled. However, the PEAS was conducted to identify factors that affect exposure to pesticides under actual field conditions, and thus represents a natural experiment in which no attempt was made to modify or control application methods or exposures. The start times ranged from 5:00 a.m. to 10:00 p.m., while the total durations ranged from 1.0 to 13.5 hours with a median of 4 hours. The differences in the start time and duration, as well as total amount applied and acres treated, could account for some of the variability in urine concentrations seen among applicators with similar algorithm scores.

Since almost all applicators used the same mixing and application methods, the effect of these variables on the urine concentrations could not be evaluated. Also, the REPAIR factor was a dichotomous variable that increased the exposure score if the applicator reported performing one or more maintenance or repair activities on the day of application. While repair activities may increase the potential for exposure, they may not always result in higher exposure than the application itself.

Another factor that could influence exposure to pesticides among these applicators was the use of a tractor with a cab. Approximately 37 percent of the applicators reported the use of an enclosed cab, and 9 percent reported the use of a cab with an air filter. The presence of a tractor cab could affect exposure levels as well as the use of PPE and thereby confound the relationship between the algorithm scores and the urinary concentrations. However, information on the use of a tractor cab was not available from the AHS questionnaire and therefore was not incorporated into the general algorithm.

For this validation study, a biological marker was used as the reference value for comparison with the algorithm intensity scores based on the assumption that higher exposure intensities will result in higher absorbed doses, leading to higher body burdens and ultimately higher urinary concentrations. However, post application urine concentrations depend on factors other than exposure intensity. In addition, breathing rates, physical exertion, surface area and location of exposed skin, and damage to the skin will also affect the total absorbed dose. Factors such as temperature and humidity, the formulation of the pesticide product, and the presence of other chemicals on the skin or in the pesticide product may also impact on the degree of absorption of the herbicide. In that the algorithm scores are intended to represent the exposure intensity rather than absorbed dose, environmental measures of external exposure, such as air and dermal samples, would provide useful reference values for further validation of the algorithm intensity scores. Despite these limitations, the algorithm was robust enough

to detect statistically significant trends in the urinary concentrations for applicators categorized by algorithm intensity score.

Conclusions: The increasing trend in the geometric mean urine concentrations observed across the three categorical exposure groups for both MCPA and 2,4-D indicates that the algorithm scores, based mostly on PPE use, provide a reasonably valid estimate of exposure intensity for these applicators. However, the large variability in the urine concentrations among applicators with similar algorithm scores suggests that opportunities may exist to identify additional exposure determinants to improve the performance of the algorithm. The statistically significant correlation observed between the algorithm scores and the urine concentrations for 2,4-D, but not for MCPA, indicates the algorithm worked less well for MCPA compared with 2,4-D. Thus, additional field studies during which air and dermal samples in addition to urine samples are collected to measure pesticide exposure levels are needed to provide the necessary data to further evaluate the algorithm for other pesticides, application methods and exposure scenarios.

Measuring Exposure to an Elemental Mercury Spill

Source: "*Measuring Exposure to an Elemental Mercury Spill --- Dakota County, Minnesota, 2004*", MMWR Weekly Report, February 18, 2005 / 54(06);146-149, http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5406a3.htm.

Elemental mercury spills can cause contamination of neighborhoods and homes and result in neurologic and kidney disorders in exposed persons who inhale mercury vapors. Often, however, difficulties exist in determining the magnitude of exposure and effectiveness of decontamination or in recognizing that re-exposure has occurred. This report summarizes the response to an elemental mercury exposure that resulted in the decontamination of 48 persons and the subsequent analysis of blood and urine samples from 14 exposed youths aged 6 - 16 years. Data from these analyses suggest that

1) blood samples are more sufficiently acquired and can be used to evaluate recent acute exposure and

2) use of a real-time mercury vapor analyzer can help public health officials determine the magnitude of exposures and help prevent re-exposures.

In addition, demolition and waste-disposal firms and government agencies must take actions to ensure that elemental mercury is adequately secured before disposal.

Case Report

In preparation for demolition of a factory in Dakota County, Minnesota, hazardous waste from the factory was temporarily stored in a shed, which was not effectively secured. During a late afternoon in September 2004, two teenagers entered the shed and found two canning jars containing approximately 21 pounds of elemental mercury. The teenagers brought the mercury back to their neighborhood, where they and approximately 12 other youths played with it, throwing handfuls of mercury at each other and splashing in a large puddle of mercury on an outdoor basketball court. This

initial exposure was limited to less than 2 hours because of rapid response by a parent who saw what the youths were doing, told them to go home and shower, and contacted the police. Subsequently, 48 persons, including 18 youths, were decontaminated with water and detergent by the Dakota County Special Operations Team between 10 p.m. and 2 a.m. Beginning at 9 p.m., homes were scanned for contamination by using a real-time mercury vapor analyzer. On the recommendation of Minnesota Department of Health (MDH) staff, residents of 12 contaminated homes were sheltered in a motel by the American Red Cross.

As part of its epidemiologic investigation, MDH staff interviewed some of the youths the morning after the event and learned that the teenagers had attempted to ignite the mercury and might have been exposed to fumes. Subsequent sampling with the mercury vapor analyzer in motel rooms of displaced families revealed mercury contamination, and high concentrations of mercury vapor found near the hair of three youths 24 hours after exposure suggested that exposures might have been more severe than initially indicated, that decontamination was incomplete, and that exposures were continuing. Consequently, 14 youths aged 6 - 16 years with known exposures were examined by physicians; 11 were evaluated at Regions Hospital in St. Paul, Minnesota.

Blood and/or urine samples were obtained from all 14 youths. However, although the youths were provided bottles for urine samples when their blood was drawn, the first samples were not provided until 3 days later, during the weekend. In addition, at Regions Hospital and at one extended-stay motel, mercury vapor concentrations were measured with a mercury vapor analyzer near the skin of the youths, and exhaled air mercury vapor concentrations were measured by analyzing air in plastic bags inflated by some of the youths. Contaminated hair and scalps of the youths were washed at the hospital with shampoo containing selenium sulfide and dried with terry-cloth towels, which were then discarded. Decontamination was verified with a mercury vapor analyzer. Follow-up samples were obtained for youths with elevated mercury levels.

Epidemiologic and Sampling Findings

All 14 patients had routine physical examinations. Two had new onset cough, and one complained of a poor appetite; these symptoms had resolved by a follow-up visit. Samples from four youths were taken at different times because not every patient agreed to provide a blood sample on day 2. In addition, blood samples drawn from two youths on day 2 coagulated; one of these persons was retested on day 10. Elevated mercury (greater than 8 micrograms per liter (µg/L)) was found in five of eight analyzed blood samples taken on day 2. Additionally, measurable amounts (5 µg/L and 6 µg/L, respectively) of mercury were found in samples collected from one child on day 4 and another child on day 10. Second blood samples collected during days 9 - 15 from the five youths with the initial elevated readings determined their blood mercury levels had declined below the laboratory reporting limit (5 µg/L). Second blood samples could not be obtained from two youths. Measurable mercury was found in the urine samples of five youths. However, these urine sample results might be unreliable because of small sample volumes.

From hour 44 to hour 98, exhaled mercury decreased for three youths, whereas readings for two youths indicated increases. The increases, along with high concentrations in a motel room, suggested re-exposure; investigation identified the source as a contaminated motor vehicle. Patient 7, who had a longer half-life of exposure than patients 5 or 6, was determined to have been re-exposed by the same contaminated motor vehicle. Comparison of mercury vapor concentrations near the skin and hair at hours 42 - 44 and 98 confirmed the re-exposures observed in exhaled mercury and the motel room. Mercury vapor concentrations in motel rooms decreased after isolation of the contaminated motor vehicle and disposal of contaminated personal items. The last blood mercury analyses for all youths, except for two patients, indicated concentrations below laboratory reporting limits (4 - 5 µg/L), suggesting cessation of the exposure. No further treatment was indicated for any patient. The correlation between blood mercury and exhaled mercury for individual youths was low.

Testing in eight of the youths' residences indicated maximum mercury vapor concentrations ranging from less than 60 nanograms per cubic meter of air (ng/m^3) to greater than 50,000 ng/m^3. Three additional homes were found to be contaminated by adults tracking mercury. Cleanup in accordance with MDH criteria and re-occupancy of all contaminated homes was completed 22 days after the initial incident. The Minnesota Pollution Control Agency used a mercury-sniffing dog to find the source of contamination in the last house cleared. Tracked mercury was located by using a mercury vapor analyzer. Three of four contaminated cars could not be cleaned to the MDH criterion for clearance and were scrapped. All visible traces of mercury were cleaned from the basketball court and other affected outdoor areas. Dakota County Public Health nurses tracked all of the youths, facilitating medical examinations and testing and providing support for families.

Editorial Note:

Exposure to elemental mercury occurs largely from inhaling mercury vapors; very little mercury is absorbed through the skin or by ingestion. Mercury spills pose a serious health hazard and are difficult to clean because most common methods (*e.g.*, sweeping or vacuuming) disperse mercury, increasing the surface area of the mercury, increasing evaporation, and exacerbating the contamination. This report illustrates that use of real-time portable instruments such as mercury vapor analyzers can enable investigators to rapidly measure mercury vapor concentrations and determine the extent of an exposure incident.

Geometric mean and 95 percent total blood mercury concentrations in the 1999 - 2002 National Health and Nutrition Examination Surveys (NHANES) for women of childbearing age were 0.92 µg/L and 6.04 µg/L, respectively, and for young children were 0.33 µg/L and 2.21 µg/L, respectively. Almost all inorganic mercury blood concentrations in the NHANES study were below the detection level of 0.4 µg/L. Geometric mean and 95 percent concentrations of urine mercury for women aged 16 - 49 years in the 1999 - 2000 NHANES data were 0.72 µg/L and 5.00 µg/L, respectively. Normal exhaled air mercury concentrations are typically less than 50 ng/m^3 for persons without dental amalgams.

The half-life of total mercury in blood for persons exposed to mercury vapor is 2 - 5 days, reflecting distribution to tissues and elimination through exhalation, which corresponds to the results in this report; blood mercury levels were below the detection limit 7 - 13 days after initial positive measurement. Exhaled mercury concentrations have been found to decrease, with half-lives of 13 - 25 hours and 1.6 - 2.3 days. These half-lives also are consistent with the results in this report. However, exhalation half-lives longer than 30 hours might indicate continuing exposure or re-exposure to mercury. The patient with the calculated half-life of 44 hours had been re-exposed on day 4. Exhaled vapor concentrations can also depend on proper exhalation by patients. To compare data between patients, investigators should instruct all patients to exhale in the same manner; however, mercury vapor half-lives are repeated measures and will not be as sensitive to individual differences. The lack of correlation between exhaled mercury and blood mercury is likely caused by measurement of different forms of mercury (i.e., total mercury for blood and mercury vapor for exhaled) and the small range of exposures.

Approximately 70 percent - 80 percent of inhaled mercury enters the blood before distribution to tissues; the rest is immediately exhaled. An estimated 7 percent of retained mercury is exhaled in the first 3 days after exposure. Approximately 9.2 percent and 2.4 percent is excreted in feces and urine, respectively, within 7 days. Conversely, mercury concentrations in blood can increase rapidly after an acute exposure to mercury, providing timely indication of exposure. In addition, the short half-life of mercury in blood can enable confirmation of the cessation of exposure. However, investigators should be aware of potential confounders to measurements of mercury concentrations (e.g., fish consumption, dental amalgams, medicinal use, and ritualistic use of mercury such as sprinkling on a floor for good luck).

In this report, the experiences of responders and investigators also underscore several recommendations for demolition and waste-disposal companies and government agencies. These include:

1) Securing elemental mercury at demolition sites,

2) Confirming mercury decontamination by sampling,

3) Providing sensitive field instruments and appropriate training for tracking mercury contamination and exposure, and

4) Incorporating quality-assurance controls into all data collection activities.

OTHER ITEMS OF INTEREST

Safeguarding Against Heat Hazards

Heat stress is preventable! Managers must understand it and use measures such as spot cooling, rest periods, thirst quenchers, and protective clothing.

Heat stress occurs when the body can not release heat and cool itself. When the air temperature is as warm as or warmer than a person’s skin, blood brought to the skin’s

surface cannot efficiently release heat. Working hard in high heat impedes the body's ability to cool itself because the muscles need extra blood, thus decreasing the amount of blood available to circulate to the skin and internal organs. Alertness, stamina, and productivity suffer, the body's core temperature and heart rate rise.

How much heat a person can tolerate without harm depends on his or her level of acclimatization. The body's inability to release excess heat can cause several ailments.

- *Heat Stroke* – is the most serious health problem facing workers. Sweating stops; the person become confused, delirious, and then loses consciousness. This individual will have a body temperature of 106 degrees F or higher and hot, dry skin that may be red, mottled, or bluish. Victims will die without prompt treatment. Move him to a cool area and soak his clothes with cool water, fanning vigorously to increase cooling.
- *Heat Exhaustion* – results from loss of fluid through sweating when the worker has not drunk enough fluids, taken in enough salt, or both. He still sweats but experiences extreme weakness, giddiness, nausea, or headache. The skin is clammy and moist, and body temperature is normal or slightly higher. He should rest in a cool place and drink an electrolyte solution to restore potassium, calcium and magnesium salts quickly.
- *Heat Cramps* – are muscle spasms caused when workers drink lots of water but do not replace their bodies' salt loss. Tired muscles usually are the most likely to cramp; this may occur at work or afterward.
- *Heat Syncope (fainting)* – can affect a worker who has not become acclimatized to a hot environment. Victims usually recover quickly after lying down for a short time.
- *Heat Rash* – also known as prickly heat, can occur in hot, humid environments where sweat is not easily removed from the surface of the skin by evaporation. This can be prevented by having the worker rest in a cool place.

Older workers find it increasingly difficult to endure heat, experts in this area say. Heavy or impermeable clothing, and some types of chemical protective clothing, also can tax the body's cooling system to or beyond its limits.

Because certain medicines and medical conditions can raise susceptibility to heat stress, managers should know the medical history and health status of their workers. For the same reason, employees who may be exposed to high-heat environments should be instructed to alert their managers when personal conditions or medications change.

NIOSH presented revised criteria in 1986 for a proposed federal standard regulating worker's exposure to heat stress, the criteria and recommendations are still available online at www.cdc.gov/niosh/topics/heatstress.

If enacted as recommended, the standard: would have established separate Recommended Exposure Limits for acclimatized and non-acclimatized workers and a heat ceiling above which no worker should have been exposed without using heat-

protective clothing and equipment; would have required Wet Bulb Globe Temperature or equivalent methods for measuring environmental heat exposure; would have directed employers to conduct medical surveillance on workers who were or might be exposed to heat stress above a Recommend Alert Limit; and would have required appropriate emergency medical treatment if a worker developed signs or symptoms of heat illness.

The standard also would have required warning signs in work areas and at entrances where there was a reasonable likelihood of heat exceeding the ceiling limit.

Good Practices to Avoid Heat Illness:

- When working in hot environments, have workers drink plenty of fluids every day. They should drink water even if they are not thirsty.
- Physical fitness is important because staying physically fit can increase an individual's tolerance for heat.
- Schedule frequent breaks in rest areas with a temperature of about 75 degrees F.
- Acclimatize the workers to the environment. This can take as long as three weeks.
- Perform the most strenuous work on cooler days or during cooler times of the day.
- Familiarize yourselves and your workers with medications and medical conditions that can worsen the effects of heat stress.
- Have the employees wear clothing that offers protection.
- Train them to recognize the signs and symptoms of heat stress.
- Prepare and post an emergency action plan.

Heat Stress Aid From OSHA

These resources from OSHA are useful for training employees and managers, assessing heat stress risk factors, or creating a program for a specific work site. They are available online via www.osha.gov/SLTC/heatstress/recognition.html.

- OSHA Fact Sheet: Working Outdoors (2003).
- Beating the Heat (2001), which answers frequently asked questions about heat stress.
- OSHA Technical Manual (1999), which includes a chapter on heat stress symptoms and guidelines for investigating heat stress at the workplace.
- Heat Stress Card (1998) is available in English and Spanish, listing symptoms of heat-related illnesses and first aid procedures.
- Protecting Workers in Hot Environments (1995), an easy-to-read discussion of occupational heat stress.

- A Guide to Heat Stress in Agriculture (1993), which explains how to set up a heat stress control program.
- Working in Hot Environments (1992, NIOSH), giving an overview of the health hazards associated with work in hot environments and precautions to prevent heat-related illnesses.
- Measurement of Wet Bulb Globe Temperature (OSHA Technical Manual Section III, Chapter 4, Appendix III:4-3, 1999), which explains how to measure and calculate the Wet Bulb Globe Temperature.

Doctors Make Eye Cells See Light

BBC News reported that experts at Imperial College London teamed up with colleagues at the University of Manchester to study a protein, melanopsin. Activating melanopsin in cells that do not normally use it made them sensitive to light. The discovery might also help treat people who get depressed as the nights draw in. The retina contains cells known as photoreceptors that interpret light levels to allow us to see. Much human blindness is due to diseases of the retina, such as retinitis pigmentosa and macular degeneration, in which the photoreceptors are destroyed. Currently there is no cure for such diseases, and once sight is lost it cannot be recovered. View the BBC News article at http://news.bbc.co.uk/2/hi/health/4209687.stm. (CHPPM HIO Weekly Update – February 4, 2004)

Holistic Ergonomics

Citation: "*Holistic Ergonomics: A case study from ChevronTexaco*," Marie P. Martin, Professional Safety, February 2005.

The San Joaquin Valley Business Unit (SJVBU) of ChevronTexaco employed nearly 1,000 people, as well as 250 contractors who worked regularly on company computers. Because of technology advances and resulting process changes, employees now spend greater amounts of time behind a keyboard. Many jobs that were previously hands-on operations positions have developed into supervisory or automation positions that require more work on a computer or control panel.

The average age for employees was 48 years. With this aging workforce spending more time on the computer, the risk of computer-workstation-related repetitive stress injuries (RSIs) increases. In addition, the company was experiencing an influx of younger workers. Within the next five years, through an aggressive hiring strategy, management planed to add many recently graduated technical employees. These young people will arrive with at least 16 years of keyboard use - often at poorly designed workstations - putting them at greater risk for RSIs over the course of their careers than older employees who have been working with computers for only a few years. Since these younger workers are typically more physically fit and, therefore, less conscious of nagging aches and pains, they may not feel the effects of their poor ergonomic habits for several years. Yet, some may already be on the path toward RSIs before they even start their first "real" jobs.

The SJVBU leadership team had taken a proactive approach to ergonomics for several years, but workers continued to experience RSIs. It was time to use a more creative strategy to prevent these injuries. Management realized that if the company ergonomics program was to reach world-class status, it needed a focused approach to reduce RSIs. The result: A global initiative known as the Repetitive Stress Injury Prevention Program (RSIPP). The program is a company standard accepted by the Corporation Management Committee as a best practice to prevent RSIs. This case study explored the refinements to the program within SJVBU and its evolution into a holistic program.

Recognizing the Problem

RSIs had begun to emerge with regularity. In 2002, RSIs accounted for 45 percent of OSHA recordables for the business unit. This occurred after RSIPP was already in place. At that time, the program consisted of ergonomic awareness training for all personnel and a computerized self-assessment performed by all employees and contractors with access to company computers. This was followed by an evaluation by a certified workstation evaluator (CWE) or ergonomist. Workers and their supervisors were expected to comply with the recommendations from both assessments.

Ergonomic aids such as keyboard trays or adjustable chairs were available if recommended. Some employees had a computer program that reminded them to stretch regularly. In addition, personnel were encouraged to report any discomfort to their supervisor so they could be reevaluated by the CWE as a rapid response case. These cases were to be handled within two working days when possible. If the discomfort persisted, the employee was sent to the doctor for a medical evaluation. This was a sound workstation ergonomics program. However, the continuing number of RSIs proved that in this business unit RSIPP needed further refinement.

Identifying Solutions

Safety leadership determined that a more holistic approach to RSIs was needed. As a result, RSIPP was modified to consist of many elements designed to work together to form a holistic approach to ergonomics. Although the program continues to evolve as lessons are learned, both metrics and employee and management feedback indicate that the program is on the right track for reducing RSI frequency and severity.

The revised program launched in January 2003. Early results indicate that the new approach was effective. Only two diagnosed RSIs were recorded in 2003 - with both cases involving individuals who had medical problems predating the new program. The purpose of RSIPP is to prevent RSIs, achieve incident-free operations and position safety as a core value in the business unit. This program's scope encompasses all employees in SJVBU plus contractors who work on company computers. Under RSIPP, the business unit can modify equipment that might lead to RSIs; intervene in the early stages of discomfort - before injuries develop; increase worker awareness of the potential for RSIs; and train employees in preventive measures.

The Elements

RSIPP consists of six elements:

1) behavior-based safety;

2) training;

3) risk assessment;

4) preventive measures based on risk category;

5) early reporting and rapid response;

6) metrics and process evaluations.

Each element encompassed various tools, some that impact all personnel who work on a company computer; others used only for those in a moderate or high-risk category for potential RSI.

Behavior-Based Safety

SJVBU's safety program had a behavior-based safety (BBS) philosophy. Ergonomics had long been a part of the observation program, but it became a more significant component. In 2003, the ergonomics portion of the observation checklist was expanded to include a variety of proper workstation behaviors. Each employee must perform a minimum number of BBS observations. Some teams require at least one workstation BBS observation each month. These observations reinforce good ergonomic behaviors - for both the worker observed and observer/coach. In addition, the BBS Steering Committee produced a training video that demonstrated the proper way to perform a workstation ergonomics BBS observation.

Training

Education and training are essential aspects of RSIPP. A workforce knowledgeable about potential hazards is more likely to avoid such hazards and work safely. Most people readily accept that an oilfield is dangerous, but many people must be reminded that a benign-looking computer workstation located in a modern office can cause a disabling injury if improperly used or incorrectly set up. Therefore, everyone who worked on company computers had to complete a computer-based training unit on workstation ergonomics.

This training was only the first step, however. Workstation ergonomic awareness training was presented in each area as well, and all new hires and summer interns received this training as part of their first-day orientation. Everyone with direct reports - including all new supervisors - received training on their leadership role and expectations under RSIPP. During this training, all supervisors were asked to commit to their role and responsibility in preventing RSIs and to lead the efforts necessary to support all RSIPP elements. The most recent addition in this area was the supervisor's toolkit training, a computer-based module that covers RSIs, their causes, prevention and risk assessment, plus rapid response, work fitness program and RSIPP elements.

Field ergonomic awareness was another topic presented to workers who operated in the field. In addition, an ergonomics program geared specifically toward field work was being rolled out across the business unit to help prevent RSIs that may be caused by job duties not related to keyboards.

Risk Assessment

Each person has unique ergonomic needs. To identify those at greater risk for RSIs, each employee must be evaluated. Two methods were used to accomplish this: a computer-based self-assessment and an assessment by a CWE. All computer users must complete an initial self-assessment. Those who receive a high- or moderate-risk rating must complete another assessment each year, while those who receive a low-risk rating do so biennially.

These assessments often generate recommendations for equipment or behavioral changes. The supervisor was responsible for working with the person to ensure that recommendations were completed, and computer-generated reminders were automatically sent to both parties until the issue was closed out.

In addition, the CWE evaluated everyone who worked on a computer. The worker and supervisor were then responsible for complying with recommendations generated by the CWE. Furthermore, when a person was assigned to a new workstation, the CWE performed an assessment for the employee at that new location.

Preventive Measures Based on Risk Category

Once a person's risk level had been identified, appropriate preventive measures were implemented. For example, every computer featured a program that reminds the worker to take stretch breaks. These reminders appeared on the screen based on a set number of mouse clicks or keystrokes.

However, the tech-savvy workforce quickly learned how to reset the program's timing so that the breaks occurred less frequently, while others simply ignored the reminders. Review of the data shows that the worst offenders were usually those who eventually develop an RSI or at least report discomfort. To address this, supervisors tracked these data monthly and used the information to coach employees as necessary. Some managers have made the breaks mandatory - computers lock-up until the three-minute stretch break has ended.

At the SJVBU, these breaks were considered to be on par with PPE. Overriding, ignoring or working through the breaks was considered as serious as working in the field without the proper safety glasses or hearing protection. Departments that were experiencing the most incidents of RSIs were becoming the most proactive in managing these data to encourage personnel to take stretch breaks. As employees found that they felt better and worked better when they took sufficient ergonomic breaks, they have become more open to the concept as well.

A new office building that was completed in 2003 had state-of-the-art workstations with adjustable keyboard platforms and monitor stands that could be raised to standing height to allow workers to change positions throughout the day. Fully adjustable chairs

were available at each workstation as well. The facility also had an ergonomics break room equipped with mats, exercise balls and resistance stations that employees could use for 10-minute ergonomic breaks. Some workgroups have initiated an ergonomics buddies program to encourage participation in RSIPP. The program paired coworkers who reminded each other to take their breaks and often exercised or visited the ergonomic break room together. The facility also had an on-site fitness center where employees could work on overall physical fitness, which in turn reduced their susceptibility to injuries.

Both the self-assessment and CWE evaluation can generate recommendations for additional ergonomic aids such as document holders, a specific chair or a different type of mouse. To ensure timely delivery of these items, the most commonly recommended items were stocked onsite; in addition, through an agreement with the business unit's primary office supplier, most recommended equipment was delivered the same day.

In addition, twice a week, a free yoga class was held onsite during lunch; it is open to anyone who wants to participate. The instructor helps employees stretch those muscles that become most overworked during computer use. Relaxation exercises at the end of the class further reduce muscle tension. Lunch break is usually 30 minutes, but the leadership team extended it to 60 minutes for yoga participants on class days. This not only allowed for a more effective workout, it also demonstrated management's commitment to worker safety and health and to reducing RSIs.

Yoga classes were offered at the business unit headquarters where departments with the most intense data input jobs (such as accounting and procurement) were located. The classes were initiated by the office safety and health committee. To date, field area safety committees had not implemented classes, but all had equipped exercise rooms where people could workout or take stretch breaks. The classes were popular among those whose jobs placed them at the greatest risk for a workstation-related RSI, while less popular in the field, where this risk was lower and most workers considered stretch breaks to be adequate.

In addition, a massage therapist who specialized in RSI prevention was available at the main office and some area field offices. This benefit was sponsored by the safety and health committees, and the company paid half the cost for these 15-minute massages. Due to demand, the massage therapist visited headquarters three days a week. In the field offices, where interest in massage has grown more slowly, the therapist visited one day a week. In several areas, the safety and health committees have not made massage therapy available either because of difficulty finding a qualified practitioner in a remote location or lack of employee interest. As with yoga, massage was more popular among those who spent the greatest part of their workday at a computer workstation.

When the CWE evaluation determined that a worker may be at a very high risk, or when a person was experiencing discomfort, his/her work assignments were temporarily changed until they could be evaluated by a physician. Based on the physician's recommendations, the person may have temporary work restrictions until

the physical issues are resolved. Personnel whose jobs require intense data input were coached to use key-based shortcuts for commands that they would ordinarily perform with a mouse. If necessary, a work team may implement task rotation to ensure that no one bears an inordinate amount of any one repetitive task.

Early Reporting & Rapid Response

As part of their ergonomics education, employees learned that by the time they feel pain, an injury may already have occurred. People were encouraged to report feelings of discomfort when they first occurred. The earlier intervention occurs, the more successful these efforts will be. Although some people were initially hesitant to report pain, the logic of this procedure soon convinced most people of its benefits. Early reporting became an accepted practice, and supervisors were trained to thank employees for reporting the first signs of discomfort rather than waiting for an injury to occur.

When an employee reported early discomfort, they were placed in the Rapid Response Program. The supervisor reassigned duties so that the worker experiencing discomfort was using the computer as little as possible until the CWE could perform an evaluation. The CWE may be able to alleviate the situation by recommending different ergonomic equipment (such as an alternative mouse) or increasing the number of stretch breaks. If the CWE determined that the situation could not be corrected through basic fixes, the employee was evaluated by a clinical screener. If the clinical screener determined that the problem was more serious, the employee was sent to the doctor for evaluation.

At the SJVBU, a rapid response case was considered a near-hit because it was possible that the discomfort would be ignored and develop into an injury. Contractors who reported early discomfort were referred to their company management because the situation may become a workers' compensation issue.

If the doctor diagnosed an RSI, the employee was required to follow all medical restrictions. However, positive diagnoses became rare because employees reported early discomfort. When the medical evaluation produced negative diagnosis for a definitive medical condition (e.g., carpal tunnel, tendonitis), the employee was placed into the Work Fitness Program (WFP). The CWE could also recommend employees to the WFP based on a rapid response assessment for unresolved computer workstation discomfort.

Work Fitness Program

WFP is a holistic approach to mitigate unresolved discomfort identified in the rapid response process. It is monitored by the CWE in conjunction with the supervisor and RSIPP coordinator. The CWE developed a regimen of exercises and services for the employee based on his/her symptoms and condition. A typical program consisted of stretching exercises or other light workout activities to be performed in the ergonomics break room. The on-site fitness instructor taught the employee the proper way to perform the exercises.

The CWE may also recommend a certain number of massage therapy visits, and instruct the therapist to concentrate on specific areas relating to the person's discomfort. If the person needed extra stretching, the CWE may recommend yoga classes. The company paid for all costs related to massage therapy or use of the fitness center when recommended by the CWE. The supervisor and CWE agreed on the employee's time commitment for the exercise regimen, and the fitness trainer may adjust on-site scheduling to accommodate if possible.

The employee communicated his/her status weekly to the supervisor and CWE. The RSIPP coordinator linked between supervisor and CWE as needed. The employee was allowed to perform these activities during work hours if they coordinated with the supervisor to ensure adequate work coverage.

Initial WFP recommendations were for two weeks. Then, the CWE determined whether the employee had benefited. Although each person is unique and response may vary, indications that the program was effective include subjective signs such as cessation of discomfort, an increased feeling of well-being and the employee's awareness of becoming more physically fit. Objective signs of improvement included feedback from the massage therapist regarding the employee's muscular response to therapy; the yoga instructor's evaluation of the employee's increasing flexibility; and the fitness trainer's comments regarding the employee's improved ability to perform recommended exercises.

Based on these results, along with a follow-up discussion with the employee, the CWE could determine whether the employee was progressing. The CWE can recommend that the employee remain in WFP for up to two months. If the person had not improved in that period of time, then they were referred to the clinical screener. Most employees who participated in the program had found it to be beneficial and enjoyable, and have given it favorable reviews. The conditioning routine requires a personal commitment. Positive behaviors such as regularly working out were reinforced while in WFP, and many people continued to use the fitness center or schedule massages after they had rotated out of WFP.

Metrics & Process Evaluations

To determine its effectiveness, RSIPP was evaluated on a regular basis and revised as needed to ensure that it was functioning optimally. Annual reviews of lessons learned and worker and management feedback ensured that the program was revised to best meet employees' needs. Some lessons learned have included a need to better communicate the rapid response program to employees, some of whom were not aware that they can have more than one workstation evaluation if discomfort returns; identification of new supervisors who need to be trained in their RSIPP roles and responsibilities; greater supervision for the WFP "procrastinator"; better communication of the importance of taking computer-generated ergonomic breaks; and a more thorough listing of symptoms that may signal repetitive-stress-related discomfort to help workers and supervisors recognize the need for intervention. In each case, the

solution has been better communication, either on an individual basis, business unit-wide or through awareness training.

Certain metrics were compiled to monitor RSIPP results. These metrics were used during the annual evaluation to determine which areas need further refining. These include both leading and lagging indicators:

- number of RSIs;
- number of rapid responses (near-hits);
- percent of employees who complete computerized self-assessment;
- percent of employees in low-, medium- or high-risk categories;
- number of employees evaluated by CWE;
- number of employees referred to WFP;
- number of employees referred to clinical screener or doctor for evaluation;
- departmental statistics for computer-generated ergonomic breaks;
- number of ergonomics awareness classes for employees;
- number of supervisors trained in RSIPP;
- number of rapid response evaluations by CWE.

A corporate survey has shown that 44 percent of program participants have lowered their risk level and 49 percent of those who originally experienced constant or frequent discomfort now report infrequent discomfort or have alleviated their discomfort. Across the corporation, the average cost per RSI claim for workers who have participated in RSIPP was at least 40-percent lower than for claims of non-participants. Within the business unit, RSIs have been reduced from 45 percent of claims in 2002 to 27 percent of claims in 2003.

In addition to these metrics, feedback was gathered from the RSIPP coordinator, CWE, supervisors, employees, contractors, physician and corporate support personnel. Regular review and improvement kept the program flexible enough to meet the changing needs of the business unit. Ongoing feedback from all stakeholders served as a reality check so that efforts were directed at those areas that needed attention and refining.

The six RSIPP elements provided an array of tools that contribute to this flexibility. Rather than being a cookie-cutter program, the program's assortment of holistic solutions can be customized to solve the ergonomic needs of each worker. The ability to adapt the elements and personalize the tools as needed was a major contributing factor to the program's success.

Resources, Roles & Responsibilities

No program of this size can be fully managed and implemented by one person. The SJVBU management recognized the seriousness of RSIs and had made a true

commitment to reducing the number of injuries to employees and contractors. Management's level of commitment was demonstrated by the resources in personnel, time and money invested in the program.

Clearly defined roles and responsibilities ensured that all elements of RSIPP were addressed. This also avoided duplication of effort and facilitated seamless delivery. The RSIPP coordinator communicated with all RSIPP resources to ensure that everyone understood their responsibilities and the importance of their role in overall program success. Business unit personnel resources applied to the reduction and prevention of RSIs included:

Building Resources Dept. (BRES)

BRES personnel ordered and installed ergonomic equipment as requested by supervisors per CWE recommendations. They maintained a supply of the most frequently requested ergonomic aids and work with the office supply vendor to ensure fast turnaround between order and delivery. Economies of scale can be achieved when a single point for ordering and purchasing ergonomic equipment is established across the business unit.

CWE

The CWE is an ergonomics specialist. Since fitting the workstation to the worker is the CWE's most important ergonomic role, this specialist evaluates workers who score in the medium- and high-risk categories, responds to rapid response requests and provides direction on workstation set up. When an employee continues to experience discomfort despite all possible ergonomic adjustments, the CWE develops and monitors an individualized WFP.

Corporate Health & Medical Personnel

This group provides ongoing assistance and advice on RSIs. The medical expertise in this group is a valuable resource when making decisions regarding both individuals and the overall RSIP program.

Corporate RSIPP Personnel & Plan

The corporate plan provides a framework with which to gauge the local business unit's plan development. This plan is used in the annual business unit RSIPP review and analysis. Those who manage this plan are another valuable resource.

Fitness Instructor

This professional, who is trained in various aspects of kinesiology and physical fitness, works under the CWE's direction to develop and helps employees with individualized WFPs. Employees must be taught the proper way to perform exercises to avoid injury.

Human Resources Decision Review Board

This group of top managers from both the human resources department and other business units provides valuable feedback and oversight when considering significant

implementations or revisions to RSIPP. This board is the decision-making body relative to major process and program modifications.

Massage Therapist

Working under the CWE's guidance, the massage therapist provides a set number of therapeutic massages targeting the areas of discomfort of employees in WFP. A skilled and licensed massage therapist can provide valuable feedback to the CWE regarding the participant's response to WFP.

Operational Excellence Team

Charged with refining, supporting and monitoring core competencies across the business unit that enables the organization to operate in a safe, clean, efficient and reliable manner, the operational excellence (OE) team is another resource for RSIPP. The OE team also performs program evaluations and provides feedback on RSIPP gap analyses.

Process Advisor

This person is responsible for the management system RSIPP process. This is accomplished by putting RSIPP through a continuous improvement process; integrally linking RSIPP to other business management processes; ensuring that program elements are used to assess and manage risks to employees and contractors; and pulling together all stakeholders in the RSIPP process.

Process Owner

A member of senior management who has volunteered to champion RSIPP issues at leadership meetings and to help the process advisor and RSIPP coordinator, the RSIPP process owner removes bureaucratic or institutionalized obstacles that may interfere with full deployment and advancement of initiatives. This person furthers leadership accountability by setting direction for the program and RSIPP action team; providing perspective; aligning accountabilities; showing visible commitment; and continually engaging the workforce in achieving RSIPP objectives.

RSIPP Action Team

Consisting of core stakeholders charged with monitoring the effectiveness of RSIPP, this team develops new ways to further improve ergonomic safety within the business unit.

RSIPP Administrator

Maintaining metrics and other records are important responsibilities of this position. In addition, the RSIPP administrator schedules CWE visits and medical evaluations for employees in the medium- and high-risk categories.

RSIPP Coordinator

This person organizes, directs and coordinates RSIPP. They also attend conference calls with the vendor that supplies the computerized self-assessment software and with the corporate RSIPP coordinator to learn about the latest program developments. In

addition, the coordinator trains supervisors and workers as needed to deploy the program.

Safety Committees

Each of the seven areas across the business unit has a safety committee that focuses efforts solely in that area. These groups help disseminate ergonomic information, provide feedback on RSIPP and identify potential ergonomic hazards.

Supervisors

Supervisors take the leadership role in reducing RSIs. They attend training and roll out the program to their direct reports. Supervisors also advise the RSIPP coordinator and administrator when an employee scores in the medium- and high-risk categories. They are responsible for ordering ergonomic equipment for direct reports and must follow up to verify that adjustments have been made, equipment has been delivered and discomfort has been eased. The coaching and leadership of supervisors provides a strong base for implementing RSIPP initiatives.

Yoga Instructor

The yoga instructor works under CWE's guidance to help employees complete their individualized WFP. The instructor is trained to identify visual clues that indicate the participant's progress. Often, they can tell more about a person's increasing flexibility than the individual worker may be aware of, which is important feedback for the CWE. By providing these resources, business unit management is not only ensuring the success of the program, it is also clearly demonstrating a genuine commitment to the elimination of RSIs.

Program Costs

For employees listed as resources, activities associated with this program were part of their regular job duties and were, therefore, not calculated outside of their salaries. The company paid 50 percent of the cost for the massage therapist - $8 per person - except in WFP cases, for which the company paid the entire cost of the recommended number of sessions. The yoga instructor charged $60 per class, which was covered by the safety committee's wellness budget.

Costs associated with the CWE averaged about $25,000 per year for 1,200 employee and business partner workstation users. Several types of fully adjustable chairs were available, and these averaged $600 each. Workstations that were installed in the new business unit headquarters cost $5,000 each. These expenses were a good value as a corporate-level study of RSI claims costs has revealed that RSI prevention efforts have an immediate impact on average claim costs, even considering the overall rise in workers' compensation claims costs. Post-RSIPP claims on average cost $47,000 less than pre-RSIPP claims. At the corporate level, direct and indirect workers' compensation costs dropped $12.75 million since 2000 - largely attributable to ergonomics initiatives.

Although expenses are associated with RSIPP, management believed in preventing RSIs because safety was a core value at ChevronTexaco. This program decreased worker risk levels; reduced the number, severity and cost of claims and lost workdays; and by reducing worker discomfort, increased productivity.

Links to Other Processes

Ergonomics was a factor in many other processes. By linking to these, RSIPP supported their goals and is enhanced in return. The unit had 15 core processes, and RSIPP was linked to half of them: BBS; business partner safety management; incident investigation; management of change; operations ergonomics; road safety management; records and document management; and risk assessment and management. These core processes were interrelated and worked together to achieve the business unit's goals of operational excellence and world-class safety.

Continual Improvement

Even one RSI is too many. Given the unit's goal of zero RSIs, RSIPP was a focused effort to eliminate ergonomic-related injuries. To remain a viable, useful tool in achieving this goal, the program must continually grow and change with the needs of the business unit. As lessons learned are analyzed and the program is reviewed, RSIPP is continually refined.

Several action items have been identified and are being addressed. For example:

1) Increase the number of employees and contractors who complete the self-assessment with a goal of 100-percent completion rate for the year.

2) Train new supervisors and employees in their RSIPP roles and responsibilities.

3) Increase the acceptance of computer-generated ergonomic breaks.

Most employees understood that they must complete a workstation self-assessment. However, some were distracted while completing it and forgot to return to the website to complete the program. To address this, a quarterly report showed those who had not completed the assessment. Supervisors used these reports to remind and coach workers, as well as to identify those contractors who must complete the assessment. The reports have greatly reduced the number of incomplete assessments, and the results were expected to improve this year as the program matured and personnel became more familiar with their ergonomic responsibilities.

Training new supervisors and new employees is an ongoing effort. All personnel must understand the potential hazards posed by workstations and the processes in place to mitigate these hazards. An informed workforce is more likely to practice safe behaviors that help them avoid RSIs.

Computer-generated ergonomic breaks were not new to the business unit; however, some people continued to ignore these reminders. To counter this, supervisors received monthly reports on computer use and break compliance within their teams. Supervisors could then identify workers who needed additional ergonomic coaching and education. By placing the avoidance of breaks on a par with failure to use PPE,

management has further emphasized the importance of this program. Over time, some doubters have realized that they truly feel better and can work more effectively as a result of taking regular breaks from the keyboard.

Conclusion

Recognizing the seriousness of RSIs, the SJVBU management committed itself to reducing these injuries. The original RSIPP was a good start, but it needed further development to help the business unit reach its goal of zero RSIs. With an aging workforce now spending more time at a keyboard and an influx of young workers with a history of working at poorly designed workstations, it was determined that a more focused, holistic approach to ergonomics was needed. Today's RSIPP is a well-rounded program with many options.

By taking a creative holistic approach to ergonomics and remaining flexible, the SJVBU was taking a proactive stand against RSIs. With strong, visible support from management and the collective efforts of many dedicated people, ergonomic injuries within the business unit may fade into oilfield history along with wooden pump jacks and wildcatting.

Ergonomics Reference Web Sites

OSHA Safety & Health Topics: Ergonomics
www.osha.gov/SLTC/ergonomics

Cornell University: CUErgo
http://ergo.human.cornell.edu

The Ergonomics Society
www.ergonomics.org.uk

Human Factors & Ergonomics Society
www.hfes.org

NIOSH Safety & Health Topic: Ergonomics & Musculoskeletal Disorders
www.cdc.gov/niosh/topics/ergonomics

UCLA Ergonomics
www.ergonomics.ucla.edu

International Ergonomics Assn.
www.iea.cc

University of Louisville Center for Industrial Ergonomics
www.louisville.edu/speed/ergonomics

National Library of Medicine & National Institutes of Health: MedLine Plus: Ergonomics
http://www.nlm.nih.gov/medlineplus/ergonomics.html

University of Virginia: Office of Environmental Health & Safety: Ergonomics Program
http://keats.admin.virginia.edu/ergo/home.html

University of Maryland: Occupational Safety & Health: Ergonomics
http://www.des.umd.edu/os/erg/

ASSE Develops White Paper on Workplace Violence

The authors of the American Society of Safety Engineers' (ASSE) "Workplace Violence Survey and White Paper" urge employers to take action now to reduce the incidence of homicide in their workplace.

In 2003 workplace homicides increased faster than any other cause of a worker fatality. Females made up 81 percent of the 631 victims. In all, 5,559 people died from job-related injuries in the U.S. in 2003. Transportation incidents were the number one cause of on-the-job deaths, followed by falls as the number two, and homicides as the third cause of fatalities. Workplace suicides are also on the rise, with 218 recorded in 2003. The majority of homicides (487) were due to shootings followed by 58 fatalities from stabbings.

The authors of the paper pointed out that the OSHAct informs employees that they have a general duty to "furnish to each employee, employment and a place of employment that is free from recognized hazards that are causing, or likely to cause, death or serious harm to the employee." One co-author, JoAnn M. Sullivan, CSP, noted that, "Employers, under the theory of respondent superior, are vicariously liable for any actions committed by its employees within the scope of their employment."

For more information and a full copy of the workplace violence survey and recommendations check www.asse.org/newsroom .

Hearing Protection and the NRR

Citation: *"Hearing protection",* by Lee D. Hager, Industrial Safety and Hygiene News, February 2005.

It's one thing to supply your workers with hearing protectors. It's quite another thing, however, to make sure they are wearing the appropriate hearing protection.

Hearing protection devices (HPD) today are typically selected based on criteria that seem simple but may lead to problems in real-world application. After the all-important price point, the key criterion for most users is noise reduction rating (NRR). Most users select HPD with the highest available NRR, assuming that "bigger is better." But understanding the NRR and the HPD evaluation process can lead to better decision-making and more realistic application of HPD evaluation findings.

Calculating NRR

For many kinds of HPD, OSHA uses the EPA evaluation process described in 40CFR211 Subpart B, employing the procedures in American National Standards Institute (ANSI) standard S3.19-1974. Even though ANSI's standards for HPD evaluation have been updated several times in the intervening 30 years, EPA's direct reference to the 1974 standard has functionally frozen that reference in time. ANSI's most recent update is S12.6-1997 (reaffirmed in 2002).

S3.19-1974 is a statistically derived, population-based estimate of HPD performance. It requires a panel of ten normal-hearing test subjects. An "experimenter" puts the HPD on the test subjects, giving no consideration to how the HPD will be used in actual application in noise.

The test is designed to assess the attenuation capability of the HPD, not how it will perform in actual use. The subject takes hearing tests with and without the HPD in place; the difference is a measure of the attenuation provided by the HPD. NRR is calculated by averaging attenuation results and applying statistical corrections to provide a level of confidence in the findings.

The bad news

The bad news is that field studies have repeatedly shown that NRR has little relationship to the amount of protection actually achieved by real users in noisy environments. While the S3.19-1974 process measures what it is designed to measure very well - the attenuation capability of HPD - it has been shown to grossly overestimate the protection actually obtained by users in practice. Further, the effect is not linear - higher lab NRR does not equate with higher field attenuation.

Part of the problem lies in the evaluation process itself. The intervention of the experimenter ensures that during the test the HPD will be used perfectly and that attenuation will be optimized. No allowance is made for real-world conditions.

Overprotection may be another factor. NIOSH indicates that 90 percent of noise exposures in U.S. industry are less than 95 dB. Thus, 90 percent of noise-exposed workers need between 10 and 15 dB of protection from noise to keep them safe. If we provide them with HPD that gives them up to 30 dB of protection if used properly, is it any wonder that they misuse the protectors in order to perform such basic tasks as communicate with co-workers, listen to their machines, etc.

Derating schemes have had an interesting effect on the HPD marketplace. Since HPD manufacturers know that most users will cut their labeled NRR value at least in half, there is increased pressure to produce products with higher and higher NRRs - which leads to more end-user problems with overprotection, yielding less field attenuation, and leading to less respect for the NRR. Simply put, it's tough to trust the NRR number on the HPD label. The devices simply do not perform in the real world like they do in the lab.

What's being done?

EPA has reopened the book on HPD evaluation by stating their intention to revisit and update 40CFR211 Subpart B. This, combined with the ongoing work of the standards community, will likely serve as the basis for revision of the guiding EPA document. The revision will have to deal with more than just an update to new standards, however. In the intervening 30 years, significant technological developments have been introduced that may not lend themselves easily to even the newest ANSI standard.

The NRR attenuation estimation process is a substitute for personal, individual HPD attenuation assessments. How will EPA deal with the new technologies that obviate the

need for NRR by developing personal attenuation rating? EPA reevaluating its HPD evaluation process is a good first step. In the interim, hearing conservation program managers are wise to use the NRR as only one aspect of HPD selection.

Company Eliminates Smokers from its Workforce

Market Watch reported that Weyco Inc., an employee-benefits administrator decided to eliminate smokers from its work force by randomly testing them for nicotine in their blood or urine. The zero-tolerance tobacco policy applies to smokers in general, not just those who light up on company time. Weyco had been building up to the ultimatum for several years before four employees who opted not to take the smoking test left the company in January. In early 2003, Weyco quit hiring tobacco users and by fall had forbidden the staff from smoking on the premises. Starting in 2004, the firm added a tobacco "assessment" of $50 a month per worker who smoked and didn't go to a cessation class. Weyco gave its employees a 15-month advance notice that those who still smoked on or off the company's watch by January 2005 would be terminated. About 20 of Weyco's 200 workers kicked the habit and four quit before the company's mandatory testing last month. View the Market Watch article at http://cbs.marketwatch.com/news/story.asp?guid= percent7B1D53E5CE-894E-4DB8-BB29-F48D9CB09DC6 percent7D&siteid=google&dist=google. (CHPPM HIO Weekly Update – February 4, 2004)

Injections Equal to Surgery For Carpal Tunnel

Citation: "*Injections Equal to Surgery For Carpal Tunnel*," by J. Croasmun, *Ergoweb*, February 2005, http://www.ergoweb.com/news/detail.cfm?id=1060.

New research suggests that steroid injections may be just as effective as surgery for long-term relief from carpal tunnel syndrome (CTS) and may be even more effective than surgery for short-term relief from CTS.

The study, published in the February 2005 issue of Arthritis and Rheumatism, followed 163 wrists belonging to over 100 patients who had experienced CTS symptoms for at least three months, particularly extreme nighttime tingling and burning in their hands and fingers sufficient to disrupt sleep. Eighty of the wrists received the standard surgical procedure of decompression of the median nerve; the remaining 83 wrists received local steroid injections. After 14 days, 69 of the previously injected wrists were injected again. Duration, severity and patient age were similar among both the surgery and steroid injection groups.

Symptoms of both groups were evaluated at three months, six months and 12 months for improvement. Ninety-four percent of the injected wrists showed significant (20 percent or better) improvement at three-months, measured by a visual analog scale; only 75 percent of the surgery group showed the same level of improvement at three months. At six months, just under 86 percent of the injection group showed significant improvement while 76.3 percent of the surgery group showed a similar level of improvement. At 12 months, 69.9 percent of the injection group showed significant improvement compared to 70 percent of the surgery group.

"This is the first randomized controlled clinical trial comparing the two most common therapies for CTS. Our findings suggest that both local steroid injections and surgical decompression are highly effective in alleviating the symptoms of primary CTS at 12 months of follow-up. Nevertheless, local injection seems superior to surgery in the short term," reported Dr. Domingo Ly-Pen, one of the study's authors.

Both surgery and steroid injections are considered medical management for CTS. In situations where CTS is aggravated by work, ergonomics principals can also be applied to the workstations to help minimize the discomfort of CTS patients and to also help reduce the risk of developing CTS.

Seniors Reporting Greater Number of Injuries

Citation: "*Seniors Reporting Greater Number of Injuries*," by J. Croasmun, *Ergoweb*, February 2005, http://www.ergoweb.com/news/detail.cfm?id=1066.

Living longer and working longer may have an unforeseen negative effect on an aging population: an increased risk of injury. According to a recent report by the Consumer Product Safety Commission (CPSC), injuries requiring an emergency room visit for seniors increased 73 percent in the past decade, and in 2003, nearly 16,000 senior deaths related to accidents in the homes were reported. That, coupled with the fact that seniors are remaining physically active longer, says the CPSC, could also turn into a greater push for preventive measures to keep accidents at bay.

"Because it results in such serious injury, loss of life and loss of functional independence and it's preventable we want to do something about it," CPSC's Dr. Michele Bellantoni told MSNBC. Says the CPSC, doing something about senior injuries including alerting seniors to danger zones for accidents, even in places like home bathrooms and kitchens, is more important than ever. Additionally, the CPSC points to accident prevention and awareness for seniors as a key to a healthy future, particularly as seniors continue to remain active as they age.

In addition to informing seniors of accident potentials, another way to help reduce the risk of accidents in both home and work spaces is by making the spaces more accommodating to an aging population through ergonomics, and, in particular universal design which strives to create environments usable to everyone, regardless of age or ability.

Sunshine May Play a Part in Preventing Cancer

The *Globe and Mail* reported that sun exposure can actually prevent cancer and play a role in its treatment. The new study concerns melanoma, a potentially fatal form of skin cancer for which sun exposure is the principal risk factor. It suggests that the more a person is exposed to the sun, the greater their chances of surviving skin cancer. Those with a history of sunburns, on the other hand, were more likely to succumb to skin cancer. A second, unrelated research paper found sun exposure also reduces the risk of developing non-Hodgkin's lymphoma and Hodgkin's disease, two forms of cancer that start in the lymph nodes. Earlier research has suggested excess sun exposure may play a role in both. The key factor is vitamin D, which the body produces when

exposed to sunlight. But the scientists also speculate that sun exposure itself, which is believed to cause DNA damage that can lead to cancerous mutations, may also bolster the body's ability to repair DNA and fend off cancer. (CHPPM HIO Weekly Update – February 4, 2004)

Syphilis Rates Not Result of Unsafe Sex

Forbes.com reported that the epidemic of syphilis among American gay men may be a product of the natural evolution of the disease, not the result of condom fatigue and more unsafe sex. Statistics from 68 American cities show that syphilis rates go up and down in regular cycles. The researchers suspect the disease loses steam as previously infected people develop temporary immunity, but then recovers a few years later when there are more vulnerable people in the population. The number of syphilis cases in the United States reached almost 7,100 in 2003, the third annual increase in a row. While syphilis is easily cured with drugs, officials have raised an alarm because the disease appears to make it easier to transmit the virus that causes AIDS. View the Forbes.com article at http://www.forbes.com/lifestyle/health/feeds/hscout/2005/01/26/hscout523638.html. (CHPPM HIO Weekly Update – February 4, 2004)

Illness Triggers Half of Bankruptcies

The *Chicago Sun-Times* reported that a new Harvard study of bankruptcy cases shows that medical bills and illnesses are a major cause of roughly half of this country's personal bankruptcies. Touted as the first in-depth analysis of medical causes of bankruptcy, the study looked at 1,771 court records of people who filed for bankruptcy in 2001 in five federal districts, including one in Illinois. More than half of those bankruptcy filers were interviewed in detail about their finances and health. The researchers determined that 46.2 percent to 54.5 percent of the nearly 1.5 million personal bankruptcy filings in 2001 could be chalked up, in large part, to medical problems. The study found that the majority of medical bankruptcy filers nationwide were middle-class homeowners with some college education. They usually had health insurance, too. More than 75 percent of people in medical bankruptcy were insured when they first got sick. View the Chicago Sun-Times article at http://www.suntimes.com/output/news/cst-nws-bankrupt02.html. (CHPPM HIO Weekly Update – February 4, 2004)

New Clues for Sciatica Pain Relief

Health Day News reported that for years, damaged discs in the lower back or spinal nerve problems have taken the blame as the most common cause of sciatica, a painful condition in which the sciatic nerve in the back of the leg is pinched and pain radiates down the leg. But a new study suggests the cause of sciatica pain may actually be piriformis syndrome, a condition in which a muscle in the buttocks called the piriformis compresses or irritates the sciatic nerve. Some 232 patients whose symptoms of sciatica had not improved after diagnosis or treatment for a damaged disc underwent MR neurography, a technique that generates detailed images of nerves. Some 69 percent had piriformis syndrome, while the other 31 percent had some other nerve,

joint or muscle condition. To treat piriformis syndrome, the researchers injected a long-acting anesthetic into the spine, muscle or nerve areas. About 85 percent of the patients got some relief from the injections, which helps relax muscle spasm. However, relief was not long-lasting and 62 patients needed surgery to correct the syndrome. Of those, 82 percent had a good or excellent result during the six-year follow-up. View the Health Day News article at http://www.healthday.com/view.cfm?id=523726. (CHPPM HIO Weekly Update – February 4, 2004)

Mercury Levels in Vaccines Eyed

ABC News reported that a 1991 memo from the drug maker Merck & Co. shows that its executives were concerned about high levels of mercury in children's vaccinations nearly eight years before health officials disclosed a similar finding. Six-month-old children who received shots could get a mercury dose up to 87 times higher than guidelines for the maximum daily consumption of mercury from fish. The memo came at a time when health authorities were recommending shots for children that contained an anti-bacterial compound called thimerosal which contains mercury. In 1999, federal health officials concluded that routine vaccinations were exposing many infants to quantities of mercury above health guidelines. The U.S. Public Health Service said there was no evidence of harm but urged manufacturers to avoid mercury in vaccines. View the ABC News article at http://abcnews.go.com/Business/wireStory?id=482265. (CHPPM HIO Weekly Update – February 11, 2004)

Waist Not, Heart Risk Not

CBS News reported that your waistline is a window to your heart's health. Waist size is a better predictor of heart disease than total body fat. Larger waists mean greater heart disease risk. Scientists have pinpointed the exact numbers to watch out for. Using a tape measure is easier than calculating your body mass index (BMI) and it's also better at assessing heart disease risk. Men should strive for a waist size of 35 or under and women 32 or under. The researchers found that waist size correlated better than BMI with risk factors for heart disease - high blood pressure, blood sugar, and cholesterol. View the CBS News article at http://www.cbsnews.com/stories/2005/02/09/health/webmd/main672699.shtml. (CHPPM HIO Weekly Update – February 11, 2004)

Architect Accused of Bug Deaths

BBC News reported that the negligence of an architect caused the death of seven people in one of the UK's worst outbreaks of Legionnaires' disease. Preston Crown Court was told Gillian Beckingham failed to properly maintain an air conditioning unit at the Barrow arts centre, where the outbreak began. She and the Barrow Borough Council deny seven counts of unlawful killing and breaching safety rules but she admits breaking health and safety laws. Ms. Beckingham was in charge of the air conditioning unit at Forum 28 arts, when it sprayed deadly bacteria into the air. The outbreak led to the deaths of six women and one man and infected nearly 200 other people. Alistair Webster QC, prosecuting, told the jury, "It was an outbreak that could have been avoided by the exercise of a moderate amount of care." View the BBC News article at

http://news.bbc.co.uk/2/hi/uk_news/england/cumbria/4246685.stm. (CHPPM HIO Weekly Update – February 11, 2004)

Change in Recipe for Flu Vaccine

The *San Francisco Chronicle* reported that a new strain of influenza that turned up first in Santa Clara County six weeks ago is rapidly emerging in the United States, complicating efforts to pick the right vaccine for next year's flu shots. The flu strain is a variant of the predominant A/Fujian virus, which is responsible for most of the influenza in the country this winter. Dubbed A/California, the new strain does not appear to be any more virulent than the older one, which has produced a mild flu season so far this year. However, its rapid emergence raises questions of whether this season's vaccine will work against a late surge of a new viral strain. Until recently, it looked like the primary candidate for the new vaccine was A/Wellington. It has yet to appear in the United States but is now emerging as the dominant strain in flu outbreaks in Europe. View the San Francisco Chronicle article at http://www.sfgate.com/cgi-bin/article.cgi?file=/c/a/2005/02/07/MNGM5B72761.DTL.

The *International Herald Tribune* reported that next season's influenza vaccine will be changed to protect against a new strain of the virus that was first identified in California last month and is spreading widely. The new strain has been identified in more than 20 percent of influenza viruses isolated from patients in recent weeks and is expected to be the dominant one circulating in the Northern Hemisphere next season, said the World Health Organization official, Dr. Klaus Stöhr. The strain, A/California/7/2004 (H3N2), was first identified from a specimen taken from a patient who had influenza in September, said Dr. Carol Glaser, chief of the viral branch of the California Department of Health Services. The standard flu shot is composed of three different strains of influenza virus. The California strain will substitute for A/Fujian, Stöhr said. The two other strains will remain the same: A/New Caledonia/20/99 (H1N1), which has been included for the last six years, and B/Shanghai/361/2002, which has been included for two years. The health organization panel will meet in September to recommend the strains for the vaccine for the Southern Hemisphere. View the International Herald Tribune article at http://www.iht.com/articles/2005/02/11/news/flu.html. (CHPPM HIO Weekly Updates – February 11-18, 2004)

Air Pollution Damages Babies in Womb

Reuters reported that babies' DNA can be damaged even before they are born if their mothers breathe polluted air. Researchers monitored the babies' exposure to polycyclic aromatic hydrocarbons, which are compounds produced by burning. Women were rated as having high, moderate or low exposure based on average pollution levels for the group. They tested the umbilical cord blood of the newborns, looking specifically at the chromosomes, which carry the DNA. Damage to chromosomes can cause cancer. "We observed 4.7 chromosome abnormalities per thousand white blood cells in newborns from mothers in the low exposure group, and 7.2 abnormalities per thousand white blood cells in newborns from the high exposure mothers," Dr. Frederica Perera said in a statement. This kind of damage to the chromosomes is the type that tends to

linger, making people more susceptible to cancer. (CHPPM HIO Weekly Update – February 18, 2004)

Potatoes Deliver Hepatitis Vaccine in Human Trials

Scientific American reported that hepatitis B (HBV) infects millions of people annually and nearly 1 million die each year worldwide, despite the existence of safe and effective injectable vaccines. Vaccines that can be administered orally stand a better chance of being successful in poorer countries that have high death rates from treatable maladies. To that end, researchers grew potato plants engineered to carry a gene that encodes the hepatitis B surface antigen. Once they had a plant that expressed high levels of the protein, the researchers cloned it and grew a number of the plants in a greenhouse. Forty-two volunteers then participated in a placebo-controlled, double-blind study in which they ate bite-sized pieces of the transgenic spuds or regular ones on three different occasions. After feasting on the tubers, the subjects underwent blood tests to assess their levels of HBV antibodies. Sixty percent of the subjects that ate the transgenic potatoes showed marked increases in their immune responses to HBV. View the Scientific American article at http://www.sciam.com/article.cfm?chanID=sa003&articleID=0009ABBD-14FF-1211-94FF83414B7F0000. (CHPPM HIO Weekly Update – February 18, 2004)

Chemical Safety Board Reports on Investigation of Dust Explosion

The U.S. Chemical Safety and Hazard Investigation Board (CSB) investigated the phenolic resin dust explosion that killed seven workers, injured 37 others and destroyed CTA Acoustics Inc.'s Corbin, KY plant February 20, 2003. The report concluded that faulty Material Safety Data Sheets (MSDS) and inadequate safety management appeared to have been root causes of the accident. The incident occurred when a fire in a malfunctioning oven ignited a cloud of phenolic resin dust that had been generated during the cleaning of a production line.

The CSB opined that the catastrophe should not be called an "accident" because CTA and a chemical supplier knew of the resin dust hazards. The board voted 3-0 to approve a final report that blamed the incident on faulty CTA safety systems and on the design of the CTA facility by former owner CertainTee. Investigators found that CTA had been aware the dust could explode but did not communicate this hazard to workers or modify their operating procedures or the design of the plant.

In a written statement, CTA denied it knew of the explosive nature of phenolic resin powder. "We relied upon the supplier and their MSDS for information regarding the material," the statement says.

Investigators said the MSDS supplied by raw material supplier Borden Chemical warned that the resin dust was combustible, but it did not explicitly warn of the dust's explosive properties. Borden also failed to inform its customers of an explosion and fire involving

a similar Borden phenolic resin used at the Jahn Foundry in Springfield, Mass., in 1999. That incident killed three people.

The CSB report also found that:

- Kentucky's state plan OSHA program had inspected CTA several times but did not cite the combustible dust hazard.
- Numerous inspections by insurance companies in an 8-year period prior to the event failed to identify phenolic resin dust as an explosive hazard.
- The Kentucky fire marshal's office, which has responsibility to enforce fire safety standards, does not routinely inspect industrial facilities, and had never inspected the 32-year-old plant.

More on the investigation may be found at
http://occupationalhazards.com/articles/13003

INTERNET NEWS

NIOSH Introduces Three New Topic Pages

Occupational Sentinel Health Events SHE(O)

A new NIOSH topic page provides the framework for determining an Occupational Sentinel Health Event (SHE[O]). A SHE(O) is a disease, disability, or untimely death which is occupationally related and whose occurrence may:

1) Provide the impetus for epidemiologic or industrial hygiene studies or

2) Serve as a warning signal that materials substitution, engineering control, personal protection, or medical care may be required.

The topic page provides links to abstracts of review articles which classified the events. The Web site is http://www.cdc.gov/niosh/topics/SHEO.

Work Schedules: Shift Work and Long Work Hours

According to 2001 data from the Bureau of Labor Statistics, almost 15 million Americans work evening shift, night shift, rotating shifts, or other employer arranged irregular schedules. The International Labour Office in 2003 reports that working hours in the United States exceed Japan and most of western Europe. Both shift work and long work hours have been associated with health and safety risks. This page provides links to NIOSH publications and other resources that address demanding work schedules. Find the page at http://www.cdc.gov/niosh/topics/workschedules/.

Vermiculite

Vermiculite has been an established commercial commodity for well over 50 years, and is currently used throughout the world. Vermiculite ore mined near Libby, Montana, which accounted for more than half the worldwide production of vermiculite from 1925 to 1990, was contaminated with asbestos and asbestos-like fibers. Workplace exposure

to these fibers caused a serious health problem in local miners and millers, as well as some downstream workers. Mining stopped at the mine near Libby in 1990. However, concerns remain about health effects from environmental and other occupational exposures to asbestos-contaminated vermiculite, especially vermiculite that has been installed as loose-fill insulation in homes and other buildings.

NIOSH is evaluating the potential for asbestos exposure during work with vermiculite from sources other than the mine near Libby. NIOSH is also updating a study of vermiculite workers originally conducted in the 1980s. That study found significant excesses of asbestosis and lung cancer related to contaminant fiber exposures among workers at the vermiculite operations in and around the mine near Libby. While information continues to be gathered, precautions should be taken to minimize the generation and inhalation of dust during the handling of vermiculite known or presumed to be contaminated by asbestos. As with any dust, workers should avoid prolonged high-level exposures.

The topic page may be found at http://www.cdc.gov/niosh/topics/vermiculite/.

ASAIE Establishes Public Involvement Toolbox Web Site

The U.S. Army Public Involvement Toolbox is a web site of practical tools, methods, examples and information related to public involvement (specifically environmental public involvement), in support of the mission of the U.S. Army sponsored by the Assistant Secretary of the Army for Installations and Environment (ASAIE).

Intent - The primary purpose of the web site is to provide Army, Army civilian staff, and Army contractors engaged in public involvement with functional, proven techniques and information. The web site is publicly accessible (https://www.asaie.army.mil/Public/IE/Toolbox/default.html) and is intended to share the Army's commitment and approaches for public involvement with all its stakeholders.

Background - The web site was developed collaboratively by a consortium of Army personnel from a number of Army organizations engaged in public involvement. The toolbox was developed to assist Army organizations in meeting the goals of the Army Strategy for the Environment. However, the tools and techniques included are applicable and adaptable to the full range of Army activities within the United States and worldwide where meaningful interaction with the public is necessary and encouraged.

Scope - This site is intended to be one source of information for public involvement. There are other excellent sources of public involvement information within the federal government and by other organizations. Links and references to other public involvement resources are provided throughout the web site. The tools and techniques contained within the site are presented in a manner that allows Army personnel to easily find information on public involvement and develop plans and programs that meet their local needs and issues.

Download a Free Copy of NFPA 1600

A law signed in December 2004 to implement many of the recommendations made by the "National Commission on Terrorist Attacks Upon the United States," better known as the "9/11 Commission," included a provision to make NFPA 1600, *Disaster/Emergency Management and Business Continuity Programs,* the national preparedness standard. Section 7305, Private Sector Preparedness (B) Sense of Congress on private sector preparedness highlighted NFPA 1600 states, "It is the sense of Congress that the Secretary of Homeland Security should promote, where appropriate, the adoption of voluntary national preparedness standards such as the private sector preparedness standard developed by the American National Standards Institute and based on the National Fire Protection Association 1600 Standard on Disaster/Emergency Management and Business Continuity Programs."

The Commission recommended that NFPA 1600 be recognized as the National Preparedness Standard. The Commission reviewed the need for private sector preparedness during their public hearings and noted that "the private sector controls 85 percent of the critical infrastructure in the nation," and "the 'first' first responders will almost certainly be civilians."

NFPA 1600 may be downloaded without charge from http://www.nfpa.org/publicJournalDetail.asp?categoryID=914&itemID=22420&src=NFPAJournal&cookie%5Ftest=1

INDUSTRIAL HYGIENE PROFESSIONAL NEWS

AIHA Seeks Candidates for Laboratory QA Panels

The American Industrial Hygiene Association Laboratory Quality Assurance Programs (LQAP) are seeking volunteers for the Analytical Accreditation Board (AAB) and the Technical Advisory Panel TAP).

The AAB oversees the governance and processes related to the American Industrial Hygiene Association Laboratory Quality Assurance Program in accordance with documented roles and responsibilities. Board members are required to attend meetings at least two annually: once in conjunction with AIHA's annual meeting (AIHce – May/June) and once in conjunction with AIHA's fall meeting (PCIH – September or October). At any given time, the LQAP program is looking for qualified individuals to represent the five AIHA laboratory quality assurance programs overseen. As well, we have established seats on the AAB for laboratory data producers and/or regulators of the laboratory industry.

The TAP advises the AAB that oversees the governance and processes related to the AIHA LQAP. The TAP thoroughly reviews accreditation applications to one of AIHA's five accreditation programs and performs a thorough assessment of the accreditation process steps to ensure conformance to the process and to technical requirements.

Applications are available on the AIHA web site from the announcement page at http://www.aiha.org/LaboratoryServices/html/lqapvolunteers.htm. Candidates must submit their application by June 1, 2005. Candidates are expected to be members in good standing of the AIHA.

ASSE Position Statement on Representing Safety and Health in Government Affairs

The ASSE adopted the following position on February 12, 2005.

"For some years, ASSE's Government Affairs Committee has worked at finding the best way to gain recognition of its members in legislation and regulations. Gaining wide-spread recognition would help ensure that SH professionals are included in SH-related public policy solutions, help raise awareness of the vitally important role ASSE's members serve in protecting workers and workplaces, and help build recognition of the profession.

'One approach that ASSE and its members worked at was to achieve title protection for CSPs, an effort that mirrored efforts by AIHA on behalf of CIHs. Though successful in a variety of states, a small minority of ASSE members without CSPs raised the concern that these efforts did not represent all ASSE members. These concerns only added to some other difficulties that arose with the effort in a few states, and ASSE's Government Affairs Committee decided it was best to withdraw financial support for state title protection efforts. Even without direct national support, however, ASSE chapters and members working together in a state are free to decide to pursue such title recognition.

"Despite this decision, ASSE continued to find it difficult to satisfy every member in achieving recognition through government affairs. As the leading certification for safety professionals, the CSP provides a professional benchmark that leads the profession. In reality, working to insert CSP in a bill or regulation is the only way that safety professionals can be recognized. A legislator or regulator simply will not include in a bill or regulation someone with a positive work history and experience but no accepted third-party credential.

"To explain this situation and to spread the message that ASSE's guiding principal is to work on behalf of all ASSE members, the Government Affairs Committee believed it was necessary to develop a Position Statement explaining why and how it strives to gain recognition of its members in government affairs. The statement includes a preferred legislative approach to SH recognition -- already law in New Jersey -- that emphasizes the quality of the SH certification through proper accreditation instead of just the certification itself. Hopefully, that kind of law passed in more states will encourage more SH certifications to meet the highest accreditation requirements in which the CSP, CIH and a few others have invested."

JUST THE FACTS

Latest Injury, Illness, and Fatality Data from the BLS

Nonfatal injuries and illnesses, private industry

- Total recordable cases: 4,365,200 in 2003
- Cases involving days away from work: 1,315,900 in 2003
- Cases involving sprains, strains, tears: 617,186 in 2002
- Cases involving injuries to the back: 345,294 in 2002
- Cases involving falls: 272,988 in 2002

Fatal work-related injuries

- Total fatalities (all sectors): 5,559(p) in 2003
- Total fatalities (private industry): 5,027(p) in 2003
- Highway incidents (private industry): 1,166(p) in 2003
- Falls (private industry): 657(p) in 2003
- Homicides (private industry): 560(p) in 2003

The (p) indicates preliminary data. BLS reports 10 years of archive data on these cases on their web site at www.bls.gov.

PUBLICATIONS

NIOSH Poster on Recommended Medical Tests for Exposures to Chemicals

NIOSH released an updated poster that summarizes recommendations from NIOSH and OSHA for the biological monitoring of chemicals or medical examinations of workers to detect adverse health effects after exposure to chemicals. The poster, Specific Medical Tests or Examinations Published in the Literature for OSHA-Regulated Substances (NIOSH Pub. No 2005-110), is sized to be printed on a 37x25 inch sheet and can be found at http://www.cdc.gov/niosh/nmed/default.html or ordered from NIOSH Publications at pubstaft@cdc.gov.

ARMY ITEMS OF INTEREST

FDA Rules on Military's Anthrax Vaccine

The *Hartford Courant* reported that the Food and Drug Administration issued an emergency order allowing the military to use a controversial anthrax vaccine. The order, published in the Federal Register, came three months after a federal court stopped the Pentagon from forcing servicemen to be vaccinated or face punishment. The new order permits voluntary use. Nearly 500 active-duty service members have refused the vaccine and more than 100 have been court-martialed. More than 500

pilots and flight crew have retired or transferred from the Air National Guard or Reserve to avoid the vaccine. The adverse reaction rate of the vaccine is 100 times that initially stated by the vaccine's manufacturer. Adverse reactions include immune disorders, muscle and joint pains, headaches, rashes, fatigue, nausea, diarrhea, chills and fever. At least a half dozen deaths and a number of birth defects have been attributed to its use. View the FDA proposal on the FDA Anthrax information page at http://www.fda.gov/cber/vaccine/anthrax.htm. (CHPPM HIO Weekly Update – February 4, 2004) For more information on this subject see the MILVAX web site questions and answers page at http://www.vaccines.mil/default.aspx?cnt=resource/qaAll&dID=21&cID=193.

Service Stops Some from Giving Blood

The *Richmond-Times Dispatch* reported that a growing number of military personnel are unable to donate blood because of their recent service abroad. Temporary deferrals typically last between six months and three years while other deferrals may be indefinite. Restrictions on donation affect military personnel returning from areas of the Middle East where malaria is endemic; Iraq, Afghanistan and Saudi Arabia because of the parasitic disease Leishmaniasis; and parts of Europe and the United Kingdom where mad-cow disease may pose a risk. Service members returning from Turkey and Oman also may face certain donor restrictions. The military has been forced to institute similar deferrals of donations to its own blood banks. For more on the military blood program, visit their web site at http://www.militaryblood.dod.mil. (CHPPM HIO Weekly Update – February 11, 2004)

Debate over Anti-malarial Drug Given to GIs

CBS News reported that some current or former troops sent to Iraq claim that Lariam, the commercial name for the anti-malarial drug mefloquine, provoked disturbing and dangerous behavior. The families of some troops blame the drug for the suicides of their loved ones. Though the evidence is largely anecdotal, their stories have raised alarm in Congress, and the Pentagon has stopped giving out a pill it probably never needed to give to tens of thousands of troops in Iraq in the first place. The U.S. military, which developed the drug after the Vietnam War, maintains that Lariam is safe and effective, though officials have expressed some concern and the military tells its pilots not to take Lariam. In written guidance on the drug last year, the military urged commanders to send for a medical evaluation anyone who showed behavioral changes after taking the drug, "especially ... if they carry a weapon" — a description of nearly all U.S. troops in Iraq. View the CBS News article at http://www.cbsnews.com/stories/2005/02/13/iraq/main673730.shtml. (CHPPM HIO Weekly Update – February 18, 2004)

However, the *Townsville* (Australia) *Bulletin* reported that a new study of Larium (mefloquine) trialed on soldiers deployed in East Timor during 2000-01 found most soldiers trialed with Larium would be willing to use it again. The drug had earlier been blamed for psychotic behavior including violence, paranoia, murder and suicide. The authors said Larium was generally tolerated by soldiers and should be used by those

intolerant of the drug doxycycline. Almost 60 per cent of soldiers reported at least one adverse event; most commonly sleep disturbance, headache, tiredness and nausea. There were nine serious adverse events in the mefloquine arm of the study. An Australian Defence Force spokesman said, "The Army Malaria Institute continues to recommend doxycycline as the preferred frontline anti-malarial medication for the ADF," he said. "Mefloquine is only used on small numbers in the ADF when members are unable to tolerate doxycycline. (CHPPM HIO Weekly Update – February 25, 2004)

DoD EWG International News

Citation: DoD EWG News Number 40, http://www.ergoworkinggroup.org/ewgweb/IndexFrames/index3.htm.

CANADA - Reducing Number of Employees = Increasing Health Care Expenses

A recent Public Health Agency of Canada report finds employers who are downsizing to save money are actually spending more money. The report, based on a survey of over 31,000 Canadian employees, revealed:

- 25 percent of the workers spent more than 50 hours a week at work.
- 58 percent reported high levels of work overload.
- 30 percent reported moderate levels of work overload. (See Ergo News 29, How Does Overtime Impact Workers? at http://www.ergoworkinggroup.org/ewgweb/SubPages/ProgramTools/Publications/PDFnewsletters/2004NewsPDF/issue29,MAR04.pdf.)
- Increased workloads caused a $14 billion annual increase in costs for Canada's health-care system.
- Business savings achieved by reducing their payroll have been negated by increased absenteeism and higher health care expenses.

Source: Canadian Press, January 14, 2005.

NORWAY - Ergonomics is the Answer When Absenteeism Soars 25 percent

Businesses in Norway have seen employee absenteeism rates increase by 25 percent. To fight this costly increase, employers have turned to ergonomics. With work-related musculoskeletal disorders as their second most common complaints, just behind colds and the flu, companies are buying new tools and equipment and modifying work schedules - all in the hopes of improving employee health and reducing absentee rates.

In 2001, the Norwegian government implemented an agreement with employers and unions to get workers back to work. Under the agreement, employers are required to offer injured workers flexible hours or alternative duties to get them back on the job. For example, the chemical company Dynea followed the government's guidelines and brought their absenteeism rate down to just about 3 percent.

Source: New York Times, August 25, 2004.

GREAT BRITAIN - Fighting Absentee Rates with Workstation Ergonomics

In the United Kingdom, forty million workdays are lost each year due to workplace absenteeism. One way to fight the high cost of employee absenteeism is prevention. Invesco, a London financial company, tackled absenteeism rates by conducting ergonomic assessments of employee workstations (see EWG Fact Sheets at http://www.ergoworkinggroup.org/ewgweb/SubPages/ProgramTools/Publications/FactSheets.htm), and by offering health tests and counseling. Thus far, the company's ergonomics and wellness initiatives have resulted in a 6 percent decrease in single-day absences.

Source: BBC News, June 9, 2004.

ADMINISTRATIVE INFORMATION

This document was prepared for the U. S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), Directorate of Occupational Health Sciences. The POC at the USACHPPM is Sandy Monk; Program Manager; Industrial Hygiene Management Program; DSN: 584-2439; COM: 410.436.2439; e-mail: Sandra.Monk@apg.amedd.army.mil.

This document summarizes information and regulatory actions that are relevant for Army Industrial Hygiene Program personnel. We distribute this summary in electronic form only. Please make it available to your staff if they do not have direct access to an electronic copy. If you would like to be added to the electronic mailing list or if your email address changes, please contact Sandy Monk, e-mail: Sandra.Monk@apg.amedd.army.mil; or call her at DSN: 584-2439; COM: 410.436.2439; fax: 410.436.8795.

At a minimum; we review the following publications in preparing this summary: Journal of Occupational and Environmental Hygiene; the Synergist; Today (ACGIH's Newsletter); The ABIH News; OSHA Week; the Federal Register; BNA OSHA Reporter; The Journal of Occupational and Environmental Medicine; The Journal of Environmental Health; Professional Safety; Occupational Hazards; Occupational Health and Safety; and Industrial Safety and Hygiene News. We also gather information from a variety of sources on the Internet.

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